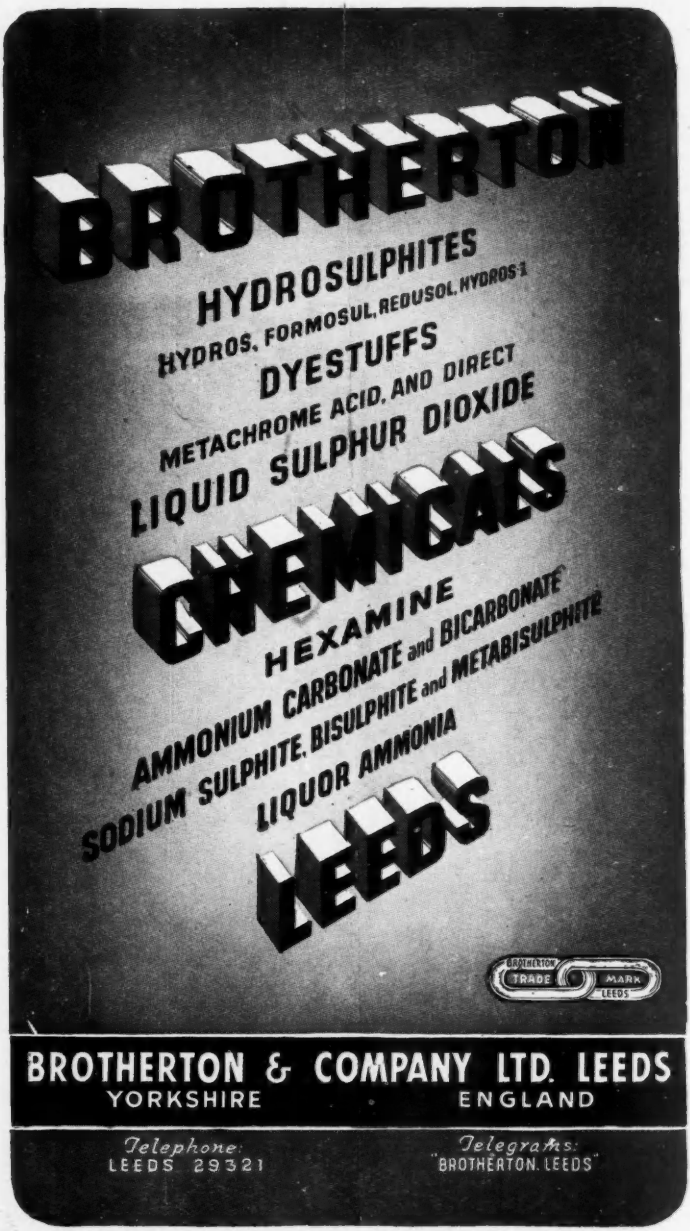
TECHNOLOGY DEPT.

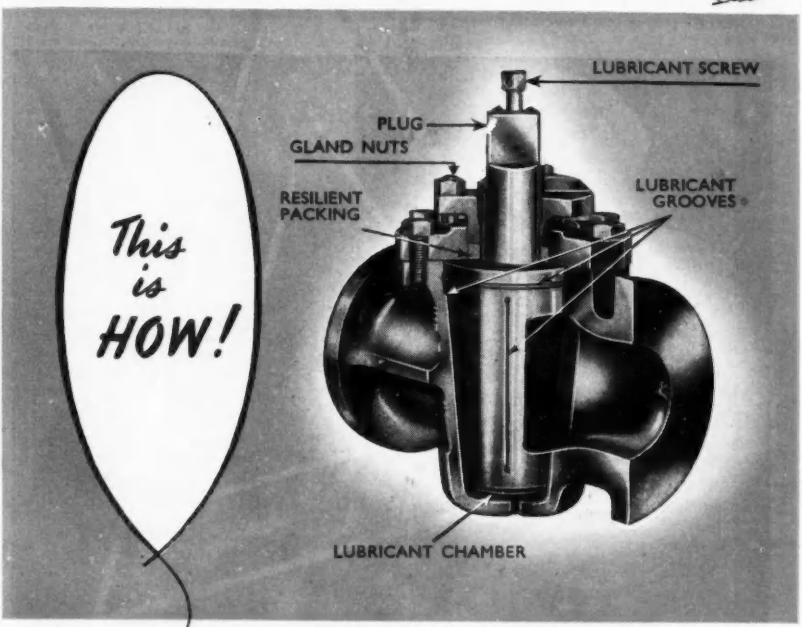
The Chemical Age

VOL. LXI 22 OCTOBER 1949 No 1580

PUBLIC LIBRARY
NOV 2 - 1949
DETROIT


BROTHERTON
HYDROSULPHITES
HYDROS, FORMOSUL, REDUSOL, HYDROS 1
DYESTUFFS
METACHROME ACID, AND DIRECT
LIQUID SULPHUR DIOXIDE
CHEMICALS
HEXAMINE
AMMONIUM CARBONATE and BICARBONATE
SODIUM SULPHITE, BISULPHITE and METABISULPHITE
LIQUOR AMMONIA
LEEDS
BROTHERTON TRADE MARK LEEDS
BROTHERTON & COMPANY LTD. LEEDS
YORKSHIRE ENGLAND
Telephone: LEEDS 29321
Telegrams: "BROTHERTON, LEEDS"

Audco Construction ensures LONG LIFE..



Keep upkeep down with AUDCO Lubricated Plug Valves.

The Standard and Inverted types of Audco Valve, which are those mainly used in the chemical industry, have but one moving part — the plug, which rotates on a film of insoluble solid lubricant. This minimizes mechanical wear, and the fact that the seats are entirely covered with lubricant minimizes corrosion. In the open position no machined surfaces are exposed to the erosion of the flowing liquor, and as the seats are never separated foreign matter does not get trapped between them. Long experience in design, the use of high quality materials, and accuracy in manufacture give practical effect to the inherent merits of the lubricated plug type of valve.

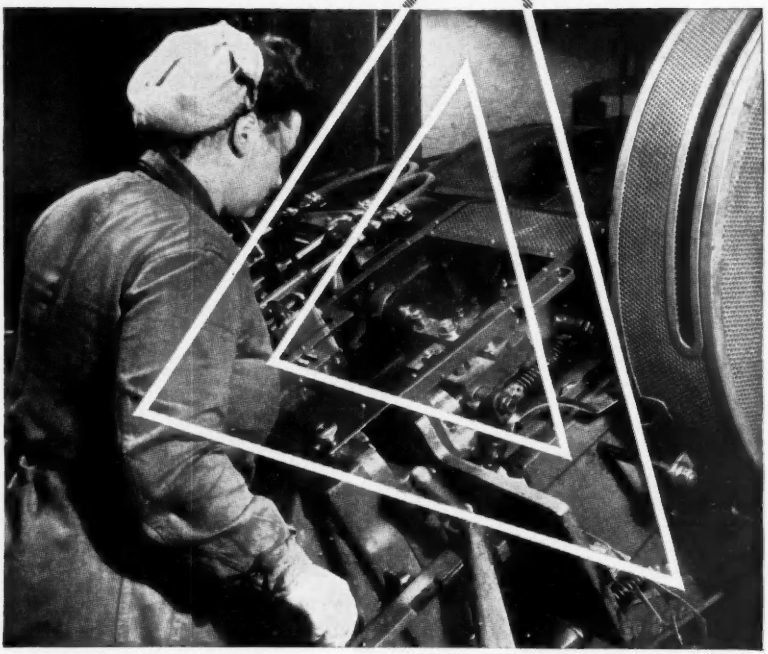
Many valves of our original designs made in the years 1923-1930 are still in active use.

AUDCO Lubricated VALVES

AUDLEY ENGINEERING CO., LTD. *Newport, Shropshire. Phone: Newport, Shropshire 3243*

A

SAFETY in industry



By courtesy of Scott & Turner Ltd.

with 'PERSPEX' machine guards

'Perspex' machine guards ensure perfect shadow-free visibility of all moving parts and provide a high degree of safety for operatives.

'Perspex' is the registered trade mark of the acrylic sheet manufactured by I.C.I. Ltd.

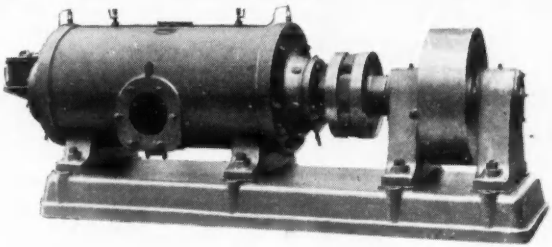
ICI

P.341

IMPERIAL CHEMICAL INDUSTRIES LIMITED
LONDON, S.W.1

INDEX TO ADVERTISERS IN THIS ISSUE

	Page
Accrington Brick & Tile Co., Ltd.	Cover iv
Audley Engineering Co., Ltd.	i
Berk, F. W., & Co , Ltd.	v
Blackwell's Metallurgical Works, Ltd.	xix
Blundells & T. Albert Crompton & Co., Ltd.	Cover iii
Boots Pure Drug Co., Ltd.	vii
British Acheson Electrodes, Ltd.	x
British Carbo-Norit Union, Ltd.	xx
British Drug Houses, Ltd. (The)	xvi
Brotherton & Co., Ltd.	Cover ii
Brown & Co.	581
Cartwrights	vi
Carty & Son, Ltd.	xvi
Classified Advertisements	582, xvii, xviii & xix
Cole & Wilson, Ltd.	xix
Evans, Adlard & Co., Ltd.	vi
General Chemical & Pharmaceutical Co., Ltd. (The)	viii
Girling, S., & Sons (Coopers), Ltd.	xx
Grazebrook, M. & W., Ltd.	xiv
Greening, N., & Sons, Ltd.	xiv
Harris, Francis W., & Co., Ltd.	xx
Harris (Lostock Gralam), Ltd.	Cover iii
Haughton's Metallic Co., Ltd.	xx
Hess Products, Ltd.	xv
Holland, B. A. Engineering Co., Ltd. (The)	iii
Imperial Chemical Industries, Ltd.	ii
Imperial Smelting Corporation, Ltd.	xii
Jobling, James, & Co., Ltd.	iv
Kestner Evaporator & Engineering Co., Ltd.	xii & 581
Leigh & Sons Metal Works,	xx
Lennox Foundry Co., Ltd.	xx
Monsanto Chemicals, Ltd.	577
Orr, George W., & Co., Ltd.	iv
Paget, R. F.	xvii
Paint Technology	581
Pascall Engineering Co., Ltd. (The)	Cover iii
Penrhyn Quarries	xx
Perry & Hope, Ltd.	xix
Petrochemicals, Ltd.	xiii
Quickfit & Quartz, Ltd.	xi
Robinson, F., & Co., Ltd.	579
Shell Chemicals, Ltd.	ix
Siebe Gorman & Co., Ltd.	Cover iv
Spencer Chapman & Messell, Ltd.	Front Cover
Staveley Iron & Chemical Co., Ltd.	xix
Tenaplas, Ltd.	viii
Tipple, W. & C., Ltd.	iv
Tretol, Ltd.	viii
Wilkinson, James, & Son, Ltd.	x
Wood & Fairweather.	xx



HOLLAND - S.L.M

Rotary Compressors and Vacuum Pumps

LOW MAINTENANCE COSTS : LONG LIFE
INITIAL EFFICIENCIES MAINTAINED
OVER YEARS OF SERVICE

The B.A. Holland Engineering Co. Ltd.

Works : Slough, Bucks.

Technical Office: LINDO LODGE, STANLEY AVENUE, CHESHAM, BUCKS. *Telephone: Chesham 406*

IMMEDIATE DELIVERY

LEVER LOCKING
DETACHABLE HEAD
DRUMS

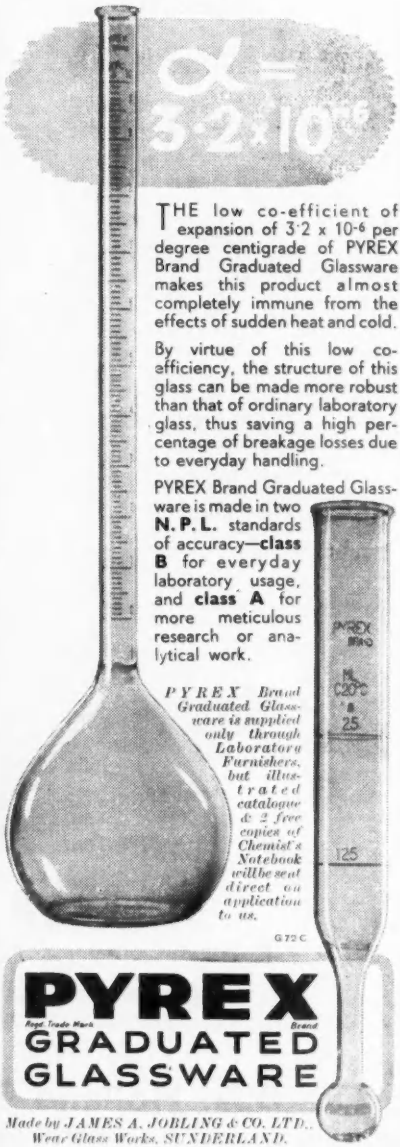
40/44 Gallon Capacity measuring 34½" × 22½"

Limited stocks

GEO.W. ORR & Co. Ltd.
8 COUSTONHOLM ROAD,
GLASGOW, S.3.

Telegrams: Containers, Glasgow.
Telephone: Langside, 1777.

If it's—
ENGINEERING SUPPLIES
your
best chance is with
W. & C. TIPPLE
Phone: ALBert Dock 3111.
W. & C. TIPPLE, LTD.
HALLSVILLE RD., LONDON, E.16



THE low co-efficient of expansion of 3·2 x 10⁻⁶ per degree centigrade of PYREX Brand Graduated Glassware makes this product almost completely immune from the effects of sudden heat and cold.

By virtue of this low co-efficiency, the structure of this glass can be made more robust than that of ordinary laboratory glass, thus saving a high percentage of breakage losses due to everyday handling.

PYREX Brand Graduated Glassware is made in two **N. P. L.** standards of accuracy—**class B** for everyday laboratory usage, and **class A** for more meticulous research or analytical work.

PYREX Brand Graduated Glassware is supplied only through Laboratory Furnishers, but illustrated catalogue & 2 free copies of Chemist's Notebook will be sent direct on application to us.

G.72.C

PYREX
Regd. Trade Mark Brand
GRADUATED GLASSWARE

Made by JAMES A. JOBLING & CO. LTD., Wear Glass Works, SUNDERLAND.

BERK CHEMICALS

Ask Berk

for

Zirconium Carbonate
Zirconium Sulphate
Zirconium Stearate
Zirconyl Acetate
Zirconyl Nitrate
Potassium Zirconium Fluoride
Sodium Zirconium Sulphate
Zircon Sand, granular and flour

Phone: Chancery 6041 (12 lines)

F. W. BERK & Co., Ltd.
CHEMICAL MANUFACTURERS
COMMONWEALTH HOUSE, 1-19, NEW OXFORD ST., LONDON, W.C.1
Also at 81, FOUNTAIN STREET, MANCHESTER, 2
Works: Abbey Mills Chemical Works, Stratford, E.15.

BLA 0849

CARTWRIGHTS
ENGINEERS & SURVEYORS
MANCHESTER 2.

For
CONSISTENT
Purity, Strength
and Quality

MAKERS OF
FINE PAPERS
SINCE 1747

POSTLIP
MILL 633
Filter Papers

Made from Finest Selected Pure Rag Pulp. Each Paper specially designed for its purpose. Send details of your requirements and we will gladly send you samples of the most suitable paper for your purpose.

POSTLIP DATA BOOK CA/1
free on application.

Sole Manufacturers

EVANS, ADLARD & CO. LTD · WINCHCOMBE · GLOS.

11857 B

Boots

Fine chemicals

Boots Pure Drug Co. Ltd. are manufacturers of the following Chemicals. Each product is subjected to strict analytical control, and represents a high standard of quality and purity.

Acetanilide Technical.
Acetanilide B.P.C.
Acetarsol B.P.
Acetarsol Sodium.
Acetomenaphthone B.P.
Acetylsalicylic Acid B.P.
Amylmetacresol.
Battery Compound B.P.D. 116.
Benzyl Cyanide Technical.
Bismuth Carbonate B.P. Light & Heavy.
Bismuth Salicylate B.P.
Bismuth Subnitrate B.P.C.
Chloramine B.P.
Chloramine Technical and Commercial.
Chloroform B.P.
Dienoestrol B.P.
Diethyl Malonate.
Ethyl Cyanacetate.
Glycerophosphoric Acid B.P.C.
Guanidine Nitrate Technical.
Hexobarbitone B.P.
Hexobarbitone Sodium B.P.
Hexœstrol B.P.
Hexyl-Resorcinol B.P.C.
Hydroxylamine Hydrochloride.
Iodine B.P.
Iodoform B.P.
Heavy Magnesium Carbonate B.P.
Malonic Acid.
Manganese Dioxide, Black precipitated.
Menaphthone B.P.
Methyl Iodide.
2-Methyl-5-Naphthothiazole.
α-Naphthylacetic Acid.
Nicotinic Acid B.P.
Nikethamide B.P.
Phenobarbitone B.P.
Phenobarbitone Sodium B.P.
Phenytoin Sodium B.P.
Potassium Citrate B.P.
Potassium Iodide B.P.
Potassium Permanganate.
Sodium Citrate B.P.
Sodium Glycerophosphate B.P.C.
Sodium Iodide B.P.
Stilbœstrol B.P.
Stilbœstrol dipropionate B.P.C.
Sulphacetamide B.P.
Sulphacetamide Sodium B.P.
Sulphaguanidine B.P.
Sulphanilamide B.P.
Sulphathiazole B.P.
Sulphathiazole Sodium B.P.
p-Toluenesulphonamide Technical
p-Toluenesulphonchloride Commercial.
p-Toluenesulphonic Acid : Commercial.

Further information will gladly be sent on request to the Wholesale Department.

BOOTS PURE DRUG CO. LTD. NOTTINGHAM ENGLAND. Phone: Nottingham 45501

LONDON SALES OFFICE: 71 FLEET STREET, LONDON E.C.4. (Phone: Central 0111)

JUDEX LABORATORY CHEMICALS

Now that increased supplies of polythene are available for packages, we are utilising its great chemical inertness for improving the closures of containers for an increasing number of reagents in respect of which polythene has proved suitable. A descriptive note will be sent on request.

The General Chemical and Pharmaceutical Co., Ltd.
Judex Works, Wembley (Room 50)

CHEMICAL CORROSION

Protection against acid and alkaline attack to all surfaces under severe conditions.

Tretol Ltd. 12-14 North End Road, London, N.W.11
Tel. Spe 4621

TRETOL
CHLORINATED RUBBER PAINT

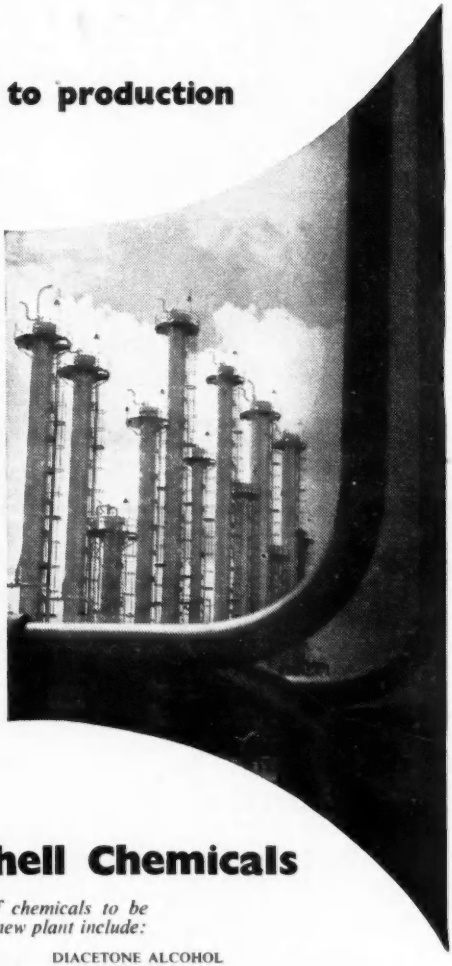
TENAPLAS
Extruded
POLYTHENE TUBING

TENAPLAS LIMITED
(POLYTHENE DIVISION),
UPPER BASILDON, Berks.
UPPER BASILDON 208·228·269·283

For ALL installations where liquid foodstuffs or strong corrosive acids have to be conveyed. Full technical details and prices upon application.

From a photograph of 9" i.d. Tenaplas *extruded* tubing awaiting delivery.

For a new asset to production



It is no exaggeration to describe the new Shell chemical plant at Stanlow, Cheshire, as a great asset to Britain's economy and industry. Here, essential products such as industrial solvents and chemical intermediates can now be produced from petroleum from sterling sources, thus saving millions of dollars on alternative raw materials. In addition to earning further foreign exchange, a full and steady supply of these essential chemicals is henceforward assured to British industries here at home—chemicals of exceptional purity and absolute consistency. For this new proof of British enterprise

SHELL

thank Shell Chemicals

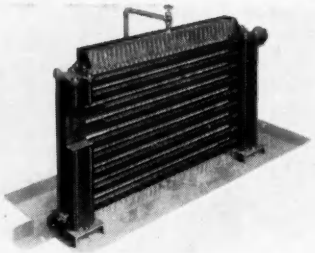
The initial range of chemicals to be produced at Shell's new plant include:

ACETONE
METHYL ETHYL KETONE
METHYL ISOBUTYL KETONE
MESITYL OXIDE
DIACETONE ALCOHOL
ISOPROPYL ALCOHOL
SECONDARY BUTYL ALCOHOL
ISOPROPYL ETHER

KARBATE

TRADE MARK

SECTIONAL CASCADE COOLERS



This cooler is made of our standard parts, in any of five pipe sizes—viz., 1″, 1½″, 2″, 3″ and 4″. Prefabricated sections carried in stock for simple assembly to meet capacity requirements. Nine foot long single pipe sections are stacked to form a series flow vertical bank. Approximately 120 sq. ft. external surface area is available in all five sizes for 6 ft. high cooler.

CONSULT—

BRITISH ACHESON ELECTRODES LTD

GRANGE MILL LANE, WINCOBANK, SHEFFIELD

Telephone : Rotherham 4836 (3 lines) *Telegrams :* Electrodes, Sheffield.

HYDROFLUORIC ACID

ANHYDROUS AND SOLUTIONS ALL STRENGTHS
ALSO PURE REDISTILLED 40% w/w

FLUORIDES, Neutral
Sodium, Magnesium, Barium, Potassium, Lead, Zinc, Ammonium, Aluminium, Lithium, Chromium.

BiFluorides (Acid)
Ammonium, Sodium, Potassium.

Double Fluorides (Cryolites)
Sodium HexafluoAluminate
Potassium HexafluoAluminate

SILICOFLUORIDES
Magnesium, Zinc, Ammonium, Barium, Potassium, Lead, Hydrofluosilicic Acid.

BOROFLUORIDES
Sodium, Potassium, Ammonium, Lead, Copper, Zinc, Cadmium, Fluoboric Acid Solution.

OTHER FLUORIDES TO SPECIFICATIONS.

Glass Etching Acids
Ammonia White Acid and VITROGRAPHINE.

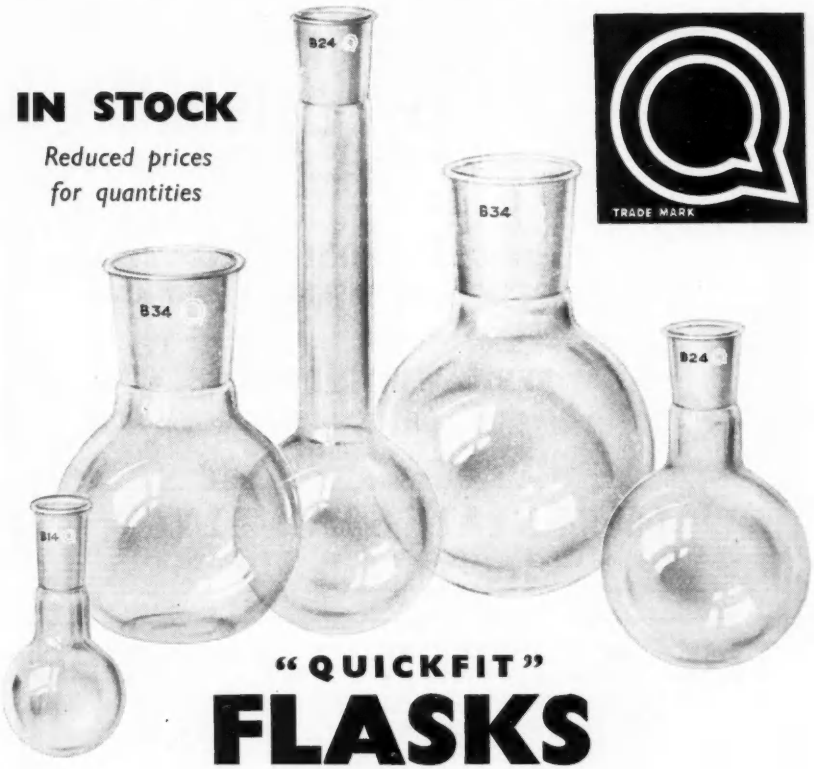
JAMES WILKINSON & SON, LTD.

TINSLEY PARK ROAD, SHEFFIELD, 9

'Phone 41208/9 'Grams "CHEMICALS" Sheffield

IN STOCK

Reduced prices for quantities



"QUICKFIT"

FLASKS

Round, flat-bottomed, extraction and conical flasks in capacities up to 250 c.c. are available from stock in the usual neck sizes up to B34. In general we are now able to give a good delivery service on a wide range of laboratory apparatus—test tubes, stoppers, adapters, still heads, condensers, receiver adapters, etc., including the Perkin triangle. Write for our latest price list published September, 1949.

Although we have not yet published a new laboratory apparatus catalogue we shall be pleased to send you our illustrated catalogue of "Industrial Plant in Glass"

QUICKFIT & QUARTZ, LTD.

INTERCHANGEABLE LABORATORY GLASSWARE
INDUSTRIAL PLANT IN GLASS

Head Office: **1, ALBEMARLE STREET, PICCADILLY, LONDON, W.1.** *Telephone: REGent 8171*

"Quickfit" Works, Stone Staffs. Telephone: 481

AVAILABLE IN COMMERCIAL QUANTITIES

BORON TRIFLUORIDE
COMPLEXES FOR POLYMERISATION

AVAILABLE IN LIMITED QUANTITIES

FLUOSULPHONIC ACID $HFSO_3$
FOR USE IN CONDENSATION & ALKYLATION

AVAILABLE IN LIMITED QUANTITIES

BENZO TRIFLUORIDE $C_6H_5CF_3$
FOR USE AS DYESTUFF INTERMEDIARY

IMPERIAL SMELTING
CORPORATION (SALES) LTD 37 DOVER ST W1

THE KESTNER T.V. DRIER

RECENTLY DEVELOPED ESPECIALLY FOR DRYING FILTER PRESS CAKES AND SEMI-SOLIDS

Several years of research and development work in our plant laboratories, combined with extensive operational experience, enables us to offer the Kestner T.V. Drier as the most satisfactory plant for handling damp materials and semi-solids.

Outstandingly successful results are being obtained in drying filter cakes, centrifuged materials and deposited sediments such as :—

Chalk, China Clay, Stearates, Boracic Acid, Coal Dust, Sand, Bicarbonate, certain Synthetic Resins, etc.

The process is based on fundamentally simple thermogravic and aerodynamic principles.

OUTSTANDING ADVANTAGES

1. SIMPLICITY. The only moving parts are feeder and fans. The only controls are the supply of steam or fuel to the heater, and regulation of the rate of feed.

2. EFFICIENCY. The thermal efficiency is extremely high—no other drying system can show better results.

3. COMPACTNESS. The plant takes up very little space.

Please write for Leaflet No. 265.

KESTNER'S

Chemical Engineers, 5, GROSVENOR GARDENS, LONDON, S.W.1

'CATAREX'

Petroleum Chemicals
by
PETROCHEMICALS LIMITED

Production for the period 1949-50 will include:

THIOPHENE-FREE BENZENE
THIOPHENE-FREE TOLUENE
XYLENE

●

CLOSE-CUT AROMATIC SOLVENTS

●

METHYL NAPHTHALENES

●

ETHYLENE
ETHYLENE OXIDE
ETHYLENE GLYCOL
AND OTHER ETHYLENE DERIVATIVES

●

PROPYLENE OXIDE
PROPYLENE GLYCOL
ISOPROPYL ALCOHOL
AND OTHER PROPYLENE DERIVATIVES

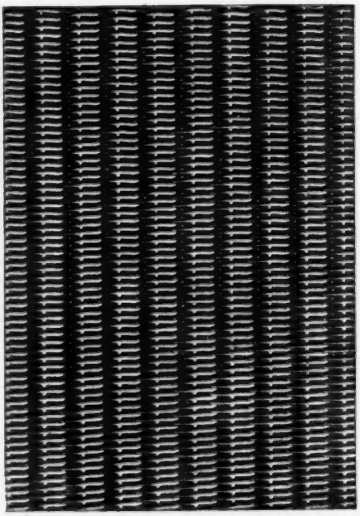
●

AROMATIC BITUMENS

Enquiries should be addressed to the Sales Department

PETROCHEMICALS LIMITED
170 PICCADILLY · LONDON · W.1

Telephone: MAYfair 6618 Telegrams: Petricals, Piccy, London



GREENING'S

"precision made"

WOVEN WIRE

FILTER CLOTHS

(HOLLANDER WOVEN)

have the estimable qualities of high mechanical strength and extreme fineness of texture. They are made in

MONEL METAL, PHOSPHOR BRONZE, STAINLESS STEEL

and other commercial metals.

EX-STOCK DELIVERY

NG 178a Please address your enquiries and requests for samples to Dept. A.C.1

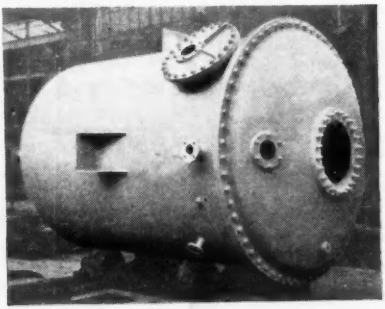
N. GREENING & SONS LTD., WARRINGTON, LANCS.

M. & W. GRAZEBROOK LTD Est. 1750

ENGINEERS and IRONFOUNDERS

Telephone DUDLEY 2431

Fabricated Plant in Mild and Stainless Steel for Chemical and Allied Trades to Clients' Designs



DUDLEY WORCS.

Pressure Vessels, Stills, Tanks, etc.

Homogeneous Lead Lining

Max. Machining Capacity 20ft. dia.

Flash Butt Welding of STEEL RINGS, *etc.*

All Sections—Max: Area 8 sq. ins.

Introducing –

Pure Fatty Acids...

will soon be available in Britain on an industrial scale. Hess Products Limited now have under construction in this country a complete plant of the most modern design, applying the very latest technique of fractional distillation for the production of pure fatty acids as developed by Armour and Company of Chicago. These pure fatty acids will be lower in price than the mixed fatty acids in use to-day as this revolutionary process imposes no premium for purity.

SATURATED ACIDS

Caprylic Acid
Capric Acid
Lauric Acid
Myristic Acid
Palmitic Acid
Palmitic-Stearic Eutectic
Stearic Acid
Pure Stearic Acid

UNSATURATED ACIDS

Mixed C-18 Fatty Acid
Unsaturated C-20 Fatty Acid
Unsaturated C-22 Fatty Acid
Low Titer Unsaturated Fatty Acid
Water-white Fatty Acid for Alkyd Resins
Special Fatty Acid for Alkyd Resins

Write for the Distec brochure containing full information on the boundless possibilities offered by Distec pure fatty acids

PRODUCTION IN LATE 1949 — SAMPLES AVAILABLE ***NOW***

DISTEC

FOR USE IN SOAPS · DETERGENTS · FATTY ALCOHOLS · COSMETICS AND TOILET PREPARATIONS · CANDLES · RUBBER STEARATES · VARNISHES · PAINTS · ENAMELS ALKYD RESINS · POLISHES · PRINTING INKS FLOTATION · CORE-OILS

HESS PRODUCTS LIMITED · 4 ALBION STREET · LEEDS 1

B.D.H.

fine chemicals **FOR INDUSTRY**

B.D.H. continue to extend the scale and range of their bulk production of fine chemicals. Fluorides (including hydrofluoric acid), formates, chromates, compounds of selenium, tellurium, thallium and strontium, iodates and periodates can be supplied in B.D.H. quality on a large scale.

Specific enquiries for pure chemicals in bulk are cordially invited, both for home and export. A list of the major products made by B.D.H. in quantity for industrial use may be obtained on request.

Telephone: Poole 962
Telegrams: Tetradome Poole

THE BRITISH DRUG HOUSES LTD.
B.D.H. Laboratory Chemicals Group
POOLE DORSET

L.L.D/22

Good timber is scarce, but for essential work

CARTY'S can still supply VATS

IN TIMBER UP TO PRE-WAR STANDARD OF QUALITY AND SEASONING

CARTY
AND SON, LIMITED
Harders Rd., Peckham, LONDON, S.E.15
Phone: New Cross 1826

The
Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4
Telegrams: ALLANGAS FLEET LONDON · *Telephone:* CENTRAL 3212 (20 lines)

Volume LXI 22 October 1949 Number 1580

Belated Help for the Universities

RECENTLY, the vice-chancellor of Oxford University commented on the salaries of University lecturers and demonstrators. "It might well be," he said, "that scholarship could be pursued and imported with less dignity and ease than used to be considered desirable, but something approaching indignity and acute anxiety had been the lot of the young married don without private means who had been trying to keep up with his subject, buy his books, travel a little to refresh his mind and meet his colleagues, to take part in the social life of his group, keep and educate his family, and pay his fantastic rent in the Oxford of 1949 on, possibly, £700 a year."

With fresh recollections of the unstinted recognition which has lately been given to the importance of the part played by university workers, both in direct research and training those who will continue its course and apply it in industry, this reminder from one of the foremost centres sounds oddly incongruous. Yet the situation is, of course, not new, nor can many claim they did not know how meagre are the rewards of those who receive such generous treatment when credits are being given. If, from Oxford, one turns one's eyes to a wider field, including what are now generally known as the "redbrick universities," £700 is a generous salary figure. The common salary range has been something of the order of £500 to £800 for a lecturer, with assistant lecturers and demonstrators lying well below that level. Thus a lecturer at a salary of £700 has been capable of representing a source of mild envy to his colleagues.

It was immediately obvious that a critical situation for the universities was caused by the provisions of the Spens report, which affected seriously the position of all teachers on the medical side. However, a position almost precisely comparable in kind, if not in degree, had gradually developed in the science faculties throughout the country. New graduates were frequently going directly to posts which were appreciably better paid than those held by the men who had helped in their training, so high was the demand for research chemists and physicists.

The difficulty of staffing the science and medical faculties in our universities has therefore been increasing steadily, and the only answer to the problem lay in the step, taken by the Chancellor of the Exchequer last March, which made provision for a radical overhaul of university salaries

On Other Pages

Leader:
Belated Help for the Universities 547
Notes and Comments:
Prof. Bernal . . 549
Which? . . 549
Rubber Substitutes . . 549
A Fertile Scheme . . 550
Exchange Rate Changes . . 551
Electronic Control . . 551
Obituary . . 551
Prof. Bernal and U.S.S.R. . . 552
Norway's Rock Wool . . 552
Coal Tar Research . . 553
Wise Use of Fuel . . 553
Nationalisation and Exports . . 554
Maladministration . . 554
New Doulton Chemical Laboratory 555
Scope and Prospects for Chemical Industry . . 557
Chemical Manufacturers' Dinner . . 560
Development of a New Explosive . . 562
Chemists and Rubber Cables . . 563
PVC Chemical Equipment . . 564
Microchemical Balances . . 565
Manufacture of Very Toxic Chemicals 568
Chemistry of Plastics and High Polymers . . 570
Potential Rival of DDT . . 571
American Chemical Notebook . . 573

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

to bring them more nearly into line with the salaries offered outside for comparable seniority, responsibility and attainment. As the vice-chancellor commented, "It was true that the proposals had to be considered at a time when it was embarrassing even to talk about salary increases." What he wished to stress was that this step had been settled in principle nearly a year before that it was part of a concerted and carefully considered policy on the part of all universities in the country, and that it was a very belated step to catch up with what had been done earlier in other quarters.

It is unfortunately true that when the revision of salaries in the universities becomes widely known, adverse comment is likely to arise in less informed quarters. When the whole position is considered in its proper perspective it should, however, be fairly obvious that there is no rational basis for complaint. In the first place, an upward revision of university salaries has lagged far behind a similar move in practically all other fields, both professional and industrial, as a brief study of recent advertisements will make abundantly clear.

Secondly, it is on the maintenance of the highest possible quality in our university staffs that much of our progress in research and industry ultimately rests. What, however, has been the recent trend? It may be argued that perhaps more than in any other field, the university teacher enters into, and remains in, his post because he has a vocation for it. Consequently the disparity has to become marked before he will forsake his proper post for a more lucrative position in industry or some other sphere. But this stage has been reached, and more and more university teachers have been forced to ask themselves whether, if they were to be fair, for example, to their dependents, they could continue to ignore such a marked financial improvement for the sake of a job in which they felt themselves properly placed. Some, then, though by no means all, of the best men have been tempted from their proper field in university work to take up more lucrative work in industry and administration. Of those who remain, most have suffered from the inevitable worry and sense of inferiority which crippling underpayment and a steadily rising cost of living have encouraged: many have been forced to supplement their incomes by "spare time" activi-

(*continued on page* 550)

Notes and Comments

Professor Bernal

BECAUSE Prof. J. D. Bernal represents one of the more refractory problems in current affairs—one of those problems on which scientists and technologists seem incapable of throwing any light at all—we have reproduced elsewhere in this issue a condensed account of what the professor told an audience which assembled in London this week to hear his views on science in the Soviet Union. Prof. Bernal's inexplicable preference for the Soviet's ways, in some of the aspects which inspire in most free scientists here something akin to horror, is a phenomenon quite as arresting as, shall we say, helium's defiance of other natural laws when it is brought to extremely low temperatures. In the abnormal atmosphere of the Soviet science departments Prof. Bernal appears to shed many of the characteristics which one associates with any other scientist of his distinction or with any other Fellow of the Royal Society. Reading even the extract of his remarks which we have the space to reproduce, it would appear that Russian academies and cultural centres represent something very like a scientists' paradise, if objection is not taken to the fact that the State is prone to decide what are and what are not acceptable theories. The professor is evidently able to accept that state of affairs with equanimity, regardless of the complete freedom for scientists here, without which it is very possible his own distinguished contributions to crystallography would never have reached fruition.

Which?

IT is significant that, while he speaks of happily renewing acquaintance with former Russian colleagues, he has nothing to say of some others, no less distinguished, whose disappearance has been the subject of much unhappy conjecture among many here who knew them before their scientific views were branded as heretical, nominally by the Soviet Academy of Sciences or equivalent authority—under direction. No one will readily suspect Prof. Bernal of deliberately perverting the facts, yet he has again presented a picture of science in Soviet Russia which conflicts with nearly everything offered by other persons of equal integrity. Some of it—strangest of all—defies the axioms to which he has himself given allegiance in his newly published essays "Science and Liberty" and "Liberty and the Individual: the Scientist's View" ("The Freedom of Necessity"—Routledge and Kegan Paul, Ltd.).

Rubber Substitutes

TO be assured that synthetic rubber, the entity around which so many economic and other battles have raged, does not exist, is prone to administer a shock to some preconceived ideas. Mr. B. B. Evans's reminder to a group of the Royal Institute of Chemistry (page 563, this issue), if not news, conveys a fact which deserves more emphasis than it usually gets when the synthetic *versus* natural rubber controversy is exercised—that there is no product commercially available which is synthetic rubber, a true, man-made reproduction of the natural product. Most of the so-called synthetic rubbers are more correctly long chain polymers, usually amenable to manufacturing technique similar to that employed for natural rubber—usually, but not universally amenable. He made clear the significance of that when he was asked to account for the fact that use of the familiar GR-S (as an example) has failed to gain a hold here, regardless of the evidence in the literature of the good results obtainable, using the cold-mix process. First, GR-S is exclusively American and costs dollars. And, says Mr. Evans, GR-S can be considered only as a sub-

stitute for natural rubber, over which it has no advantages on technical grounds, and there are definite disadvantages in its use in the longitudinal processes. The extrusion process is widely employed in America, and that permits a greater use of GR-S. The fact should be remembered that the policy "GR-S instead of natural rubber" had in the past been largely dictated to the manufacturers by the U.S. Government. There would seem to be small prospect now that U.S. rubber-using industry will depart from the course into which it had been forced by circumstances, even in the name of Economic Co-operation.

A Fertile Scheme

THE undoubted success of the British steel founders' visit to the U.S.A. this year provides every good reason for confidence that the proposed trip by a fertilisers "productivity" team from this country will be comparably successful. Once again the Anglo-American Council on Productivity is to sponsor such a venture, the Fertiliser Manufacturers' Association collaborating with the Association of Chemical and Allied Employers to ensure that their representatives are equipped with the latest available information from the industry this side of the Atlantic. The supervisory, technical and workshops sections, four men representing each, form the complete team, members of which were entertained in London this week by the ACAE—presumably to discuss policy. It is encouraging to reflect that the British fertiliser industry, which has made such rapid progress during the past decade, is likely to have valuable experience—at least in the research field—to make available to the Americans. This team, representative of a most important part of our chemical industry, may have much to learn from such vast enterprises as the Tennessee Valley fertiliser production plant, which is using unorthodox but effective methods; it will, however, in some respects be less pupil than tutor. Substantial grants are to be provided by the Government, the FMA and the industry itself, and the project being a co-operative effort, the U.S.A. will take care of living expenses and travel over there. Fuller information will no doubt be made known when trade union officials and members of the fertiliser industry will meet the Press at a reception to be held on October 28 at the offices of the Anglo-American Council on Productivity. The team sails in the *Queen Elizabeth* next day.

BELATED HELP FOR THE UNIVERSITIES

(*continued from page* 548)

ties. Such compulsions, coming at a time when increasing numbers of students, shortage of space and equipment, and other conditions consequent on the war are making a very heavy additional demand, do not make for "the intellectual serenity and objectivity . . . the leisure to think at all," which are an essential for the fostering of scholarship.

The potential university teacher of the future, at the end of his student career, is far less likely to be persuaded to risk his future in a profession which is traditionally grossly notoriously underpaid. That tradition must be buried. Implementation of the expressed intention of the Chancellor of the Exchequer will undoubtedly go far towards removing all three of these restrictions on the well-being of a vitally important profession. Anyone familiar with the place of universities in the modern community, and with their recent history in our own country, will welcome a step which they must recognise as essential, beneficial and very overdue.

Textile Malt Industry

Malt for cotton processing is now being supplied to various Irish mills by the Irish firm, Mountmellick Products, Ltd. The production is under control of Mr. Helmut Donath, of Riga, Latvia, who has recently been appointed the company's malt brewer. Licences for the entry of textile malt from Ireland into the United Kingdom are now available under a recent trade agreement between the two countries.

EXCHANGE RATE CHANGES

Effect on Import Licensing

AS a result of recent changes in certain rates of exchange, some import licences, expressed in terms of a sterling value, will not be sufficient to cover the full quantity of goods to which they were originally intended to relate, and arrangements have now been made to enable importers to meet their foreign currency commitments in respect of commercial contracts entered into on a foreign currency basis for the import of goods under valid import licences issued before October 5.

The effect of these arrangements is that authorised banks may approve applications for foreign currency to the full amount of currency contracts, so long as they are satisfied that the foreign currency applied for does not exceed the outstanding value of the relative import licence, converted at the rate of exchange ruling on September 17.

It has also been arranged that H.M. Customs and Excise will charge against import licences issued before October 5 the sterling equivalent of currency invoices, calculated at the rate of exchange ruling on September 17. [For duty purposes the current rate of exchange will, of course, apply]. Where consignments have been cleared by Customs since September 17, and the sterling value calculated at the new rate has been set against the import licence, the importer should approach H.M. Customs and Excise for an adjustment of the figures.

It should be emphasised that these special arrangements relate only to cases where the sterling cost of imports is increased because contracts have been placed in terms of foreign currency. The banks will not allow excess payments in the case of sterling contracts (even if there is an exchange variation clause) nor will H.M. Customs and Excise make any adjustments in the case of goods invoiced in sterling.

Lyons International Fair

The chemical industry will be well represented among the 5000 exhibitors at the Lyons International Fair which will be held next year from April 15-24. Among the newcomers will be R. H. Windsor, Ltd., manufacturers of plastic moulding machinery. An innovation (acknowledgment of which is made to the BIF), is the organisation of buyers' club for overseas visitors.

ELECTRONIC CONTROL

Industrial Interest in Scotland

SCOTTISH industrialists are reported to be showing increasing interest in specialised electronic equipment. The source of many such developments has been requests for a unit devised to perform a given function. From this a variety of alternative uses develop, giving a range of new appliances. Chemical companies have taken a prominent part in this process, as instanced by the electronic stop-watch unit shown at the Scottish Industries Exhibition.

This was designed originally by I.C.I., Ltd., to time the interval between the firing and explosion of a charge. It is now being adapted by a leading Glasgow firm to measure time intervals between any two phenomena. There have been many other examples of expanded use, following on a specific application.

An exhibition of standard equipment has lately been staged in the Engineering Centre, Ltd., Glasgow, by Atkins, Robertson & Whiteford, Ltd., showing Cinetel, Redifon, and Evans equipment. Another Glasgow company, Land, Speight & Co., Ltd., electronic engineers, also provided a demonstration, featuring standard equipment.

Obituary

THE death was announced this week at the age of 75 of SIR ROBERT PICKARD, F.R.S., vice-chancellor of London University from 1937-39, and for many years director of the British Cotton Industry Research Association. From 1899 to 1905 he was head of the chemical department of Blackburn Municipal Technical College, and from 1920-27 director of research of the British Leather Manufacturers' Research Association. He also served on the adhesives committee of the DSIR.

Sir Robert became director of research at the Shirley Institute in 1927. Under his guidance, the practical application of science to industry was particularly evidenced in his association with the Cotton Industry Research Association. He was vice-president of the Institute of Chemistry from 1927-30 and from 1939-43, and president from 1936-39.

PROF. BERNAL AND U.S.S.R.

Approval of Scientific Progress

BELIEF that the chemical industry of the U.S.S.R. is expanding so rapidly as to be capable in a few years of outstripping that of America, was expressed by Professor J. D. Bernal in a lecture describing his recent visit to Russia.

The professor was speaking at a meeting sponsored by the Society for Cultural Relations with the U.S.S.R. at Beaver Hall, Mansion House, London, last Saturday, and was introduced by Mr. J. G. Crowther, who observed that the professor was the first British scientist to visit Russia in the last ten years.

Crystallography

Among the great variety of subjects studied in the new department of crystallography of special interest was that of the growing of crystals in connection with the preparation of artificial quartz and other crystals for piezo-electric oscillations. There, he declared, he saw some of the most beautiful pictures of step-like and spiral growth that he had ever seen. Much of the laboratory was devoted to the study of mineral structure and X-ray methods were being extensively used. It was interesting to find, in contrast to his previous visit, that all the apparatus was Soviet-made and of excellent quality, including sealed X-ray tubes.

The professor also visited the laboratory of Prof. Oparin, where discussions were held on the light bio-chemistry could throw on the origin of life. There he also met Prof. Talmud and Dr. Bressler, from Leningrad, and heard of their work in his own field, the structure of proteins. He found that not only had they made a systematical chemical attack on the different kind of forces holding protein molecules together, but they had resynthesised soluble proteins from their constituent amino acids by the use of high pressure. "This was certainly one of the most exciting scientific discoveries of recent years."

Prof. Bernal contrasted what was being done here to utilise Scottish peat with the advance being made in the U.S.S.R. to utilise its vast peat resources. Waxes, he said, were being extracted from the peat which was also synthesised into refined fuel products and integrated chemical derivatives.

The general scientific policy of the Soviet Union was discussed with Prof. Vavilov, president of the Academy of Sciences.

Prof. Bernal answered a number of questions from his large audience.

Science in schools, he declared, was given a high place in the curriculum. While the ten-year school (up to 17 years of age) was universal, over 60 per cent in the towns continued further education up to the age of 21.

The professor caused some laughter replying to the question "What proportion of women are interested in science in the U.S.S.R.?" "Women," he said, "were 'dangerously predominant' in the Union, and took part in everything."

The problem of pursuing scientific research which did not accord with the views accepted by the State was raised. Prof. Bernal said that in some directions, such as biochemistry and the Freudian theory, new ideas had been evolved and the former theories were therefore considered incorrect and could not be pursued. He claimed, however, that only general tasks were laid down, the strategy being in the hands of the scientists themselves.

NORWAY'S ROCK WOOL

Technical Improvements

THE Norwegian concern A/S Elektrokemisk, which has experimented in producing wool from rock for the last 15 years, has established a new plant at Moss which incorporates the latest technical improvements and devices. The annual capacity of the rock wool industry in Norway is now 15,000 tons of raw wool.

Rock of suitable composition is crushed and then smelted in furnaces to an easy flowing mass. This is then projected through an orifice and divided into two or more jets and exposed to a blast of compressed air or steam, which converts it into very small globules and propels it into a "blowing room." Friction and resistance of the air forms the white-glowing globules into thin fibres, which congeal into a tangled wool-like mass.

It is an excellent insulating material, containing about 95 per cent entrapped air, and its fire-resisting properties have secured its adoption as an insulator for oil refineries. The wool mass is also processed into other forms, such as felt. For retaining and excluding heat, and as a sound insulator, the rock wool material is extremely effective. Norway is now exporting a good deal of the raw rock wool.

COAL TAR RESEARCH

Association's New Programme.

CONVERSION of what was formerly a small arms ammunition factory into research laboratories at Gomersal was reported at the first annual general meeting of the Coal Tar Research Association held recently in London.

Practically the full complement of research staff has been engaged and during the next few weeks a number of members of the staff will be spending periods of a week or a fortnight at the works of various tar distillers so as to acquire some industrial background in anticipation of the completion of all the laboratories and the start of research work on a full scale.

The association is sponsoring extra-mural work at Leeds University, Glasgow Royal Technical College and Heriot-Watt College, Edinburgh, respectively. Meanwhile the director, in consultation with the research committee of the council, has drawn up a programme of research work to be undertaken at Gomersal and this programme has been accepted by the council.

The work involved is based on the practical outlook upon the industry and its present problems. With the exception of that section of the work which will deal with what might be called "process problems," the main emphasis is on the search for fresh outlets for pitch and creosote by the application of new techniques.

The Technical Intelligence and Information services are dealing with an increasing number of inquiries, and have issued to members a number of translations of foreign papers.

Dr. E. V. Evans, first president, and Mr. H. H. Bates, honorary treasurer, were re-elected for a further twelve months as were all retiring members of the council. At a meeting of the council held later in the day Mr. Richard Robinson was unanimously re-elected as chairman.

Sulphuric Acid Decontrolled

The Board of Trade have issued an Order (The Sulphuric Acid Prices Order, 1949), which removes from Statutory control the production and distribution of sulphuric acid, and provides only for maximum prices based on those charged in the period April 1 to June 30, 1949. The Order will come into effect on October 24.

WISE USE OF FUEL

Example Shown by Institute

AT the annual dinner of the Institute of Fuel, in London last week, the Melchett Medal was presented to Sir Frank Whittle, pioneer of jet propulsion, by the president, Dr. D. T. A. Townend.

Later, proposing the toast of the guests, Dr. Townend expressed the pleasure felt at having as their principal guests Lord McGowan and Lady McGowan. Lord McGowan had ties of long standing with the institute, and had served as president. The great company over which Lord McGowan presided had set an example in the development and application of new methods for the better utilisation of fuel.

Responding to the toast, Lord McGowan emphasised that the correct use of the nation's limited fuel resources was of cardinal importance to future prosperity. In the past, coal had been our main capital asset, but we had tended to use it wastefully, and we were now faced, not only with an insufficient volume of production, but with costs which had risen out of all proportion to the general increase in prices. The shortfall in production had entailed a serious loss of exports which would have helped to balance our overseas trade.

The results of the coal crisis of 1946-47 would have been far more damaging to the national economy but for the improved efficiency of coal consumption which had been achieved as the result of the fuel economy campaign, in which the members of the Institute of Fuel had played so notable a part.

Although coal consumption was to-day no more than in 1938, industrial production had greatly increased, despite the fact that a good deal of the coal now being supplied had a lower calorific value.

Much remained to be done in fuel economy, and here he was sure that the institute would continue to give a lead. Industry should be far quicker in applying new knowledge to both design and process work.

New Professorships

Nearly 250 applications have been received for the first 12 professorships at the New University College of North Staffordshire. Decisions of the selection committee are expected about the beginning of December.

NATIONALISM AND EXPORTS

A Reader's View

SIR,—I am not sure that sufficient distinction is always made between nationalised industries fairly safe from foreign competition, such as transport, gas, electricity, and possibly coal, and those largely concerned in export trade. Although the higher costs of transport, etc., since it has been nationalised, are undoubtedly a serious additional burden on our manufacturing industries, this is perhaps trifling compared with the damage to our export trade likely to arise by nationalising, say, the chemical or the iron and steel industries.

It is practically certain that management costs would, as in other cases, rise considerably, while efficiency and all those great qualities associated with free enterprise and progress would be stifled under the cold, dead hand of bureaucracy. There is little doubt that our ability to compete in the world's export markets, against ever keener rivalry from other countries, would be weakened. And yet, while threatening nationalisation, the Government urges more export!

I have some knowledge of the chemical industries, and while they are quite capable of speaking for themselves without my help, I think it is generally agreed that they are among the most efficient and progressive of any in this country, or elsewhere. None, I suggest, devotes more effort and money to research, improving products, lowering prices, and maintaining good wages and working conditions.

These industries are remarkably free from strikes, and the workers are eminently loyal and intelligent; that is to say, they realise the importance of export markets, and if ability to compete therein is prejudiced, *e.g.*, by the nationalising mania, there is serious risk of unemployment.

There is no sense or reason in or the slightest justification for nationalisation of the chemical industry: on the contrary, there is everything to be said against it. I should say the same applies to the iron and steel industry.—Yours, etc.,

(*Name and address supplied*).

Services of Science

Workers at Fort Dunlop's research centre broadcast last week a feature in the Midland Home Service, "Scientists and You," dealing with the benefits which modern developments have brought to the community.

MALADMINISTRATION

Industrialists' View of Government

SPEAKING as chairman at the luncheon of the Society for Indicidual Freedom, in London, on October 13, Sir Ernest Benn (president) said, but for the regretted indisposition of the Earl of Selborne, they would have had "a mass attack" by the House of Lords—that institution to which, they would all agree, the country looked for what little sense was to be found today.

The masses were being fed with something which was so deceitfully called "full employment," which was in reality half work for twice the money, and the country found men to go to America and tell them that we were doing our best. "But we are not doing our best, and we know it!" declared Sir Ernest.

Britain's High Prestige

Lord Lyle of Westbourne said he was not going to deal with the crisis as it affected us abroad, but with the economic crisis at home. Mr. Aneurin Bevan had recently endeavoured to prove that the Tories had handed over to the Socialists in 1945 a bankrupt country. We certainly finished the war in an exhausted condition, but the prestige of Britain never stood higher than it did in 1945. Our prestige stood high and the name of Britain stood high. He did not think the same could be said of Britain to-day.

The Socialist Government had placed on the people innumerable burdens, not the least of which was the food subsidies of £468 millions a year, and at the same time was attempting to establish a Welfare State. Another burden which the nation had to bear was the £380 millions a year for family allowances. There was a very great desire on the part of the trade unions to raise wages and shorten hours, and longer holidays with pay had been established. No one was more in favour of the Welfare State than he was; he would like a little welfare himself. All those things were excellent institutions, and actually his own company (Tate & Lyle) had established them many years ago, and they paid higher than trade union rates!

Unfortunately, higher wages did not necessarily mean an increase of output and increased efficiency, and practically all these higher charges on the country's industry had been reflected in higher costs.

There had been an enormous diversion of effort caused by the threats of nationalisation.

NEW DOULTON CHEMICAL LABORATORIES

Exacting Need of Rapid Materials Control

AN event capable of having important effects upon the future of ceramic chemistry was the official opening on October 13 of the new laboratories of Doulton & Co., Ltd., Tamworth, Staffs. The ceremony was performed by one of the ceramic industry's leading scientists, Dr. H. W. Webb, Principal of the North Staffs Technical College, Stoke-on-Trent. Present were chemists from the firm's factories at Burslem, Lambeth, Dudley, Tamworth, and Stoke, and Mr. S. R. Hind, technical adviser to all Doulton branches. Guests included Mr. H. N. Jepson, architect, and Mr. H. Astbury, representing the Cambridge Instrument Co.

The morning programme consisted first of the presentation and discussion (under the chairmanship of Mr. Hind) of five papers, *viz.*: "Routine Ceramic Testing at Wilnecote Works," by D. B. Binns; "Rational Interpretation of Analyses of Clays," by L. E. Shipley; "Specific Surface Measurement with Special Reference to Light Absorption Methods," by A. E. Moore; "Earthenware Casting Slip Control," by G. D. Horley; and "A New Aspect of the Chemical Control of Ceramic Production," by S. R. Hind.

Pioneers in Research

After lunch at the Wilnecote Parish Hall, Mr. Hind greeted guests and fellow colleagues, and introduced the guest of honour, Dr. Webb. In a brief informal address, Dr. Webb said the work that Doultons were doing in this field was of great interest to him. Objective industrial chemical research of this kind was much more efficient, in his opinion, than Government research, which lacked the spur of the practical man and his production line. Doultons had been the pioneers in ceramic works research. He felt that the outlook shown by the company's directors in promoting research ensured that the organisation would go from success to success.

Mr. P. Berrisford, the Tamworth works manager, spoke of the time lag between investigations and the final result. Management was more interested in the practical side and post-mortems were not required.

Of topical interest during the morning session was Mr. Binns' paper dealing with the functions of the new laboratory. Its primary rôle, he said, was to maintain the quality of the Doulton products associated with the Tamworth works, chemical stoneware, drain-pipes, electrical insulators, etc. The key lay in the raw materials which would be tested in segregated batches, representative samples being taken from each. Work would include tests for moisture content, particle size, loss on ignition, and decisive tests (based on the properties of the final product) to accept or reject a given material. Trial firings would form an important part of the work.

Losses

The fact that immense losses were still incurred from time to time, he said, in this department of the ceramics industry was recognised in the paper by Mr. S. R. Hind. These would come from deviations from standard qualities such as incorrect porosity, inadequate strength, crazing or peeling of glaze, non-matching colour, lack of gloss on glaze, etc. Production processes had much to do with such faults. Appropriate physical tests were therefore applied to ensure that factory technique in the forming, drying, glazing, decorating, and firing were correctly conducted. It was still repeatedly being found, however, that some of the most serious troubles arose from unforeseen variations in the basic raw materials and their blending.

Chemical Constants

All the bodies used for the manufacture of the wide range of Doulton products relied intimately on the constancy of chemical composition of various natural clays, felspars, felspathic materials such as Cornish stone, and flint or quartz, together with bone ash in the case of bone china. Their chemical composition varied constantly—sometimes to such an extent as to create a serious danger.

A stranger to the industry would assume that this quality would be under regular and close supervision.

Mr. Hind recalled the simpler but comparable case of the Portland cement industry, whose rise to its present vast proportions and high profitability was based on the work of chemists. Having estab-

lished the correct composition of the finished product, they instituted rigid chemical control of the variable raw materials, and their consequent accurate compounding to a mixture of constant analysis. Unlike the ceramic industry, their problems were simpler, and within the current scope of laboratory technique, both with regard to method and the necessary rapidity with which results were forthcoming for control purposes.

Problems of Analysis

If requests were made to any reputable supplier of the ceramic industry's chief raw materials, ball clay, china clay, Cornish stone, or stoneware clay, for the analysis of any batch in current supply, the information supplied would relate to analyses made years ago, on a single sample taken from supplies then in production.

The industry knew that such information was grossly inadequate. But more detailed and up-to-date information if sought from laboratories engaged in this work often took several weeks and cost more than £5 per sample. Moreover, the capacity of such laboratories was too small at present to cope with any large number of samples daily.

Adequate analysis of raw materials within the Doulton organisation would be found to involve an average of four complete silicate analyses daily per factory (*i.e.*, 30 for the entire organisation) necessary for good chemical control. This would amount to about 7500 analyses per annum. It was not conceivable, said Mr. Hind, that this would cost less than £30,000 and employ over 100 analysts. Worse than this was the fact that these analyses would not be available until a week after each sample had been submitted—in some cases longer still. This would cause too much material to be held in stock awaiting authorisation to proceed with production.

Substitute Devices

Mr. Hind went on to outline the substitute devices and assumptions with which, at present, the industry had to be content. He had purposely refrained from considering the work involved in a similarly full attack on the control of glaze materials, engobes and colours. This would be subject to the same disabilities.

If the ceramic manufacturer felt that the aspects of chemical control, which he (Mr. Hind) had attempted to portray, seemed unfamiliar and perhaps grossly exaggerated, such a manufacturer should review the past history of his own business, and recall the many occasions on which, for unaccountable reasons, the profitability of his business had completely disappeared for a time.

It had to be remembered, said Mr. Hind, that in coping with the difficulty of maintaining sound production with so many unknown factors to contend with, the industry had been driven into an extremely conservative attitude, and new processes, bodies, and products were subject to extremely slow development.

In view of recent advances in spectroscopic analysis, however, Mr. Hind did not think that these obstacles to full chemical knowledge of the industry's raw materials and products need persist much longer. The prospect was that, very soon, it would be possible to obtain fully adequate control data by this method in a few hours per sample, and at a rate of many samples per day from a single skilled operative and one set of equipment.

Spectrographic Method

Mr. Hind said he had noted that the spectrographic method of analysis was already in universal use in the field of production control associated with the manufacture of alloys. In the ceramic industry, however, difficulties had been greater, and development slower. A paper published two years ago by Zander and Terry in "The Transactions of the American Ceramic Society," described their successful application of rapid spectroscopic analysis to the control of the production of vitreous enamels. Success had been claimed with such materials as felspar, zircon, and fluorspar.

At Doultons there had been collaboration for some time with Hilger & Watts, which had resulted in the employment of Dr. W. Czapska for the past six months in developing the spectroscopic method. It was too early to say that all the difficulties had been surmounted, but there seemed little doubt as to the ultimate outcome.

The purpose of his paper, said Mr. Hind, was to emphasise the extent to which the firm suffered from the great expense and "intolerable slowness" of classical analytical chemistry in the service of ceramics. This perpetuated a state of inadequate control of production, with great risk of serious manufacturing loss from time to time, and a restriction of the usefulness of the scientist in the ceramic industry, and to a rigidity which retarded progress.

SCOPE AND PROSPECTS FOR CHEMICAL INDUSTRY

Close Integration with National Policies

THE exacting responsibilities falling to the Association of British Chemical Manufacturers, resulting from the intimate interest of various departments of the Government in industrial affairs, are reflected in the association's 33rd annual report, and in the remarks made by the chairman, Sir Harry Jephcott, proposing its adoption at the association's annual general meeting last week.

He referred to several matters of general interest to chemical industry and revealed that an "enormous amount of work" had been required of the association, kindred associations and some 270 individual manufacturers to prepare for the President of the Board of Trade the report on chemical industry, now completed and about to be presented.

Summarising some other topics of special interest outlined in the report, Sir Harry Jephcott mentioned the approaching departure to the U.S.A. of a "productivity team" formed by the Fertiliser Manufacturers' Association and the preparations which had been made to send out a team in the interests of the dyestuffs industry.

The report, discussing the utility of the chemicals section of the current year's BIF, looks forward to the possibility of holding, in 1952, a chemicals and chemical plant exhibition, distinct from the BIF.

Direct Exports

Reviewing progress made in the direct export of chemicals, Sir Harry Jephcott said the industry was entitled to be proud of what it had done. The evidence was to be found in export increases between 1938 and 1948 of 56 per cent by volume, and of value from £22 million to nearly £84 million in the ten years. The export of chemicals to the value of £44 million in the first six months of this year had heightened the trend.

He considered that the industry could, however, have done much more had its schemes of rehabilitation and expansion been sanctioned promptly by the Government after the end of the war. It was satisfactory to know that many of the schemes had now been authorised and should be coming to fruition next year, and would give an increased output to meet the requirements of home industries and the export markets. Existing plants were practically all working to full capacity.

That there was still a big overseas demand for chemicals was indicated by the recent American announcement that their exports of chemicals in the first six months of 1949 reached the record figure of $450 million, despite dollar shortages in practically all foreign countries. "The Americans," he said, "claim that this indicates a preference for their chemical products because of better quality and lower prices. We disagree with this statement as to quality, though it may be true as regards price. Our exchange adjustment should enable us to improve our competitive position and to increase our trade to non-dollar areas as additional supplies become available from the new plants.

Dollar Earnings

"It has been argued that we shall be able substantially to increase our earnings in the dollar area because of our improved competitive position. A simple calculation will show that, if we maintain our present export prices in sterling, we shall have to increase the volume of our exports by 44 per cent to earn the same number of dollars as we did before the adjustment took place. Even if we increase sterling prices by 20 per cent, we shall still need a 20 per cent increase in volume to earn the same amount in dollars.

"Where are we to get this extra volume of goods? We can only get it by increased output, unless we starve the home consumer or switch our goods from other established markets. In the chemical industry we have obeyed the Government instruction to intensify our efforts in the dollar area and we will continue to do so. The prospects of chemical exports to the United States are far from rosy, except for a limited number of coal tar products, which the American industry requires as raw materials, and for certain specialised products that have been developed here. For the general run of chemicals, the United States can rely on her own highly developed industry—now the largest in the world—having access to an abundance of most raw materials and protected by an

import tariff, which, as administered, amounts to a virtual prohibition on many classes of synthetic organic chemicals. There will be much better opportunities in other parts of the dollar area and I am sure all members will do their best to make full use of them.

"On the other hand, the exchange adjustment will be a serious handicap in purchasing those raw materials that we must buy on the American continent. Sulphur is an outstanding example.

"While we cannot be optimistic about improving our position as dollar earners, we can confidently hope from the new expansion schemes, especially those relating to the production of chemicals from petroleum, to play an increasingly important rôle as dollar savers by manufacturing ourselves most of the chemicals we have now to buy from the States."

Import Licensing

Another important factor was the recent removal of U.K. import licensing restrictions on, *inter alia*, chemicals, drugs and medicines. While the British Government had taken the initiative in the matter, other countries were under an obligation to follow suit and some had already done so.

"While we may expect greater competition from foreign chemicals," said the chairman, "we can hope for better facilities for extending our trade in the OEEC and other areas. This should be an added stimulus—if such be needed—to our members to increase their productivity, cut their costs and intensify their selling exertions to the ultimate advantage of the industry and the country. Once again we shall have an opportunity of developing that free competitive initiative that is essential to success and has for so long been discouraged by Government controls, both here and abroad, the strict limitation of imports and the existence of a sellers' market. But, while 'opportunity knocks,' 'opportunity never knocks twice.'

"We are now faced with what is in effect an economic Dunkirk. The courage, leadership, team spirit and hard work that enabled us to surmount the odds facing us in 1940 will be required in at least equal measure if we are to fight our way out of our present difficulties. The unpopular doctrine of harder work and greater economy from every member of the community has still to be brought home to the mass of the people."

The report recalls the initiation by the President of the Board of Trade, in September last year, of the proposal that the ABCM should provide "a comprehensive survey of chemical industry." The association accepted the invitation, although it recognised the many difficulties involved, particularly in regard to what scope such a review should have. The association concluded that a survey of development plans in general would not suffice and that the relationship between the chemical, and other, industries and the inter-relationship of sections within chemical industry were among the other factors which should be considered.

It was finally agreed with the President of the Board of Trade that broadly the review should cover heavy chemicals, industrial gases, fertilisers, dyestuffs, medicinal and other fine chemicals, industrial explosives, and plastics and synthetic resins, but not the compounding of chemicals to make such products as paints, insecticides, sheep and cattle dips and pharmaceutical preparations.

Thus the activities of many chemical firms will be partly in and partly outside the scope of the report and a large number of those generally regarded as part of the chemical industry are entirely excluded. The Government departments concerned decided that any inquiry into the tar distillation industry, normally regarded as an integral part of the chemical industry, should be undertaken by the Ministry of Fuel and Power.

The following associations had co-operated with the ABCM in preparing the report: The British Colour Makers' Association, British Sulphate of Ammonia Federation, Ltd., The National Sulphuric Acid Association, Ltd., British Plastics Federaion, and the Superphosphate Manufacturers' Association, Ltd.

Report Committee

To prepare the report, the deputation to the President of the Board of Trade was authorised by the council to act as a committee, which determined the nature of the inquiry. This was made not only among members but also with a number of firms who are not members of the associations mentioned.

The ABCM council recalls that practically everyone operating within the defined field replied to the questionnaire, and a large mass of valuable data was obtained.

By June 30, the greater part of the report was ready for the printer and the confidential appendices, to be seen only by the Board of Trade, setting out for each firm, under a code number, its research programme in general terms, its schemes for extending its research and develop-

ment facilities, and its detailed plans for the expansion and rehabilitation of production, over the next five years, were in printer's proof. The report will be confidential to the President of the Board of Trade and will remain so until publication of it may be agreed between the President of the Board of Trade and the council.

The association has been in close touch through the Federation of British Industries with the Anglo-American Council on Productivity. It welcomed the proposals that teams drawn from management, technicians and operatives should visit appropriate factories in the U.S.A. to study American organisation and methods, and use the information obtained in an endeavour to increase productivity in this country.

A joint committee with the Association of Chemical and Allied Employers agreed that it was desirable that productivity teams should be organised from the chemical industry and that the two associations should work together.

The ABCM was asked to undertake the organisation, on the basis that any members of the ACAE who were not members of the ABCM should be invited to the meetings when the subject was under discussion. It appeared probable that more than one team would be required.

The discussions had already removed initial misunderstandings. In particular, it was now appreciated that technical "know-how" in the sense of detailed information on chemical processes will not be made available to the teams nor will American teams expect to be given such information when they pay a return visit to this country. The aim was to have the teams from the chemical industry ready to go out next spring.

Measuring Productivity

The question of how productivity is to be defined and measured was occupying the attention of several members of the association.

On the subject of exhibitions and the BIF, the association's report recalls that the chemical section at this year's BIF was notable for a new type of lay-out which was generally regarded as a great improvement over those adopted previously. Most exhibitors reported a falling off in the number of inquiries received, but it was generally agreed that the proportion of genuine and substantial inquiries was higher than in previous post-war fairs.

A number of members had expressed the view that the British Industries Fair may not be the best exhibition medium for chemical products. Discussions had, therefore, been started with the British Chemical Plant Manufacturers' Association and other trade associations to explore the possibility of staging a combined exhibition by the chemical industries and the makers of their equipment, to be held at, say, three-yearly intervals. The present suggestion was that the first such exhibition might be held in 1952.

The association's report discusses the Patents and Designs Bill, on which it made a number of recommendations before the Bill was published in March, and concludes that the proposals "represent a desirable advance on existing legislation." It singles out for approval the provision which will permit the patenting of chemical compounds, as such, instead of only the method of manufacture. The association had recommended to the Swan Committee, which was primarily responsible for the draft, that provision should be made for granting chemical products patents.

Chemical Tariffs

Reviewing some aspects of overseas trading during the year, the association records that it had sought reduction or stabilisation of the chemical tariffs by the countries associated with the general agreement on tariffs and trade, reached in Geneva in 1947. The increase of bilateral agreements between Continental countries had been observed. Such agreements, to which the U.K. was a party, had called for chemical exports of substantially higher value than in 1948. Largely increased provision of chemicals was required in the current agreements with Argentina and Sweden.

Competition from Germany in chemicals had been closely watched and the association had taken up a number of cases concerning the export of chemicals and pharmaceuticals from Germany at unduly low prices.

Little progress had been made during this year in the distribution of chemical plant taken from Germany as reparations, and in a number of cases in which the coming availability of plant had been notified the small interest shown by manufacturers here had not justified the making of a bid by the U.K. The benefit from German reparations to British chemical industry had been negligible and was likely to remain so.

Brief references are made elsewhere in the report to several topics of general importance. On the subject of tar distillation products, which is primarily the responsibility of the Association of Tar Distillers, it is recorded that a proposal from

the Ministry of Fuel had sought to place supply problems in the hands of a joint committee of producers and consumers under the chairmanship of the Ministry's by-products controller. That proposal had been unanimously resisted by the ATD and the ABCM.

The rising production of fine chemicals in the U.K. is noted in connection with the study of imports of chemicals under KID arrangements, and it is foreseen that a substantial reduction of fine chemical imports will be made possible by current schemes for expanding production here.

Similar gains have also been recorded in the field of dyestuffs and intermediates production, in which the operation of some new plant had helped to put an end to shortages experienced in 1948. Needs in this country were being met, except in regard to a few specific dyestuffs. Development schemes to repair that deficiency were in hand. An export target for this year of £750,000 monthly had been agreed with the Board of Trade.

A considerable part of the association's work during the year was associated with the subject of safeguarding chemical workers. Comparative tests had been made of British and American detector tubes for indicating the presence of carbon monoxide, and comparison of the methods of (1) colour matching and (2) measuring the length of a stain had resulted in a strong preference for the latter. Further tests are to estimate the probable accuracy of the determination by these tubes. Responsibility for reviewing tests for toxic gases in industry belonged to the Department of Scientific and Industrial Research, and the association had recommended to the Chief Inspector of Factories a list of six gases deserving early attention. These were gases or gaseous products of benzene, chlorinated hydrocarbons, chlorine, hydrogen chloride, hydrogen cyanide, hydrogen fluoride and sulphur dioxide.

Chemical Manufacturers' Dinner

"U.K. Industrial Research as Large as Any."

SIR ROBERT ROBINSON, president of the Royal Society, and Sir Archibald Rowlands, permanent secretary of the Ministry of Supply, were among the principal guests at the annual dinner in London on October 12, of the Association of British Chemical Manufacturers. Both made lively and constructive contributions to the after-dinner speeches, before one of the largest gatherings mustered by the association since the war. Sir Harry Jephcott, chairman of the ABCM, presided and gave an interesting commentary on industry's great modern activity in the field of research, with which Sir Robert Robinson had dealt from the standpoint of the universities.

The latter, proposing the toast of "The Association," invited the ABCM to use its influence in a practical matter in which it could be of great assistance—the duties on hydrocarbon oils. Very soon the question would have to be discussed whether the duties on these oils should be relaxed. Having in mind the vast importance to chemical industry of the chemical products derived from hydrocarbon oils, it seemed to him of the greatest importance that the Government should be induced to discontinue these duties and to give a chance to an industry which was in the early stages of its development.

Of the research functions of the universities, Sir Robert Robinson called to mind the fact that the overriding responsibility of the universities was to train students, and they were having the greatest difficulty in performing that function adequately in relation to the present great demand for scientists to carry on research. In the furtherance of research, industry enjoyed many advantages, seeking the solution of particular problems and commanding greater resources in laboratory equipment and workers. It was a commonplace in university research that anyone having an outstanding assistant in the laboratory was very shortly going to lose him.

It was essential that the universities should be left to follow their own lines of research and the likelihood was that discoveries of value to industry would continue to be made. Industry would undoubtedly take advantage of all such discoveries, develop them further and take out the patents! As evidence that industry was, however, not always content only to take, Sir Robert Robinson mentioned the practical assistance which had been given by Boots Pure Drug Company, British Drug Houses and others to the university department which was trying to do something quite off the usual university line—to synthesise colesterol. One industrial group had made available 500 gm. of a substance very diffi-

cult to make, which would have taken months to produce in the university laboratory.

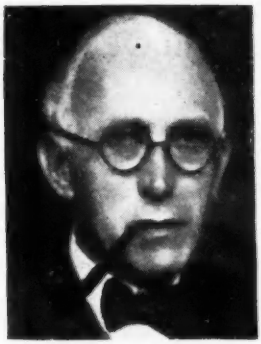
He urged that industry should continue to manage its own research problems. "Don't give *ad hoc* research to the universities," he pleaded, "but support them with all your might and main."

Sir Harry Jephcott replied to the toast. He concurred with the view of the president of the Royal Society that industry must shoulder its own research problems, yet it needed to keep in very close touch with what was being done in the universities. Proof that chemical industry was playing in full its part in research was conveyed in information made available by members of the ABCM and others. Each member firm maintained a research staff, having a defined programme, and the chemical development and research programme in the aggregate was at least as large as that of any other industry in the country—probably larger. He could demonstrate that at the end of 1948 chemical industry was spending on research and development not less than £8.5 million annually; and these were not capital costs but out-of-pocket annual expenditure. In addition, the industry had in hand projects for capital expenditure of £8.3 million to provide further facilities of the same kind.

When new facilities were available, the industry proposed spending a further £3 million annually on research. That would give the very substantial sum of £11.5 million a year for research.

According to a report by the National Association of Manufacturers in America, manufacturers of chemical and allied products there were spending 1.83 per cent of their turnover on research in 1947. In 1939 it had been 3.17 per cent. No exact figure for sales by chemical industry here could be arrived at, but it could be said with assurance that the ratio of research expenditure to sales certainly exceeded 2.5 per cent, and was probably 2.7 per cent. Industry here not only believed in research: it backed it with substantial sums.

Sir Robert Robinson



Sir Harry Jephcott

The chairman foresaw that industry as a whole might at some time be charged with extravagant use of research workers; they numbered more than 10,000 today and would probably total 13,000 in years to come. The answer to that was that industry was conducted by people who knew their own business, who would not incur large expenditure without proper control and the conviction that in due course results would repay the cost.

Acknowledging the real benefits chemical industry received from the indirect results of research in the universities and colleges, the chairman stressed the need for prompt and full publication. If each member company would contribute to the funds of the Chemical Council one half of one per cent of its research budget the problem of meeting the increased publication costs borne by the scientific societies would be solved.

Sir Frederick Bain, vice-chairman of the association, proposed the toast of "The Guests," cordially acknowledging the great work performed by Sir Robert Robinson, as a scientist "and in making science and the humanities one."

Sir Archibald Rowlands, responding to the toast, warmly thanked the ABCM, on behalf of Government departments, for its cordial help. He was, he said, reluctant to indulge in the meretricious arts of propaganda, but he looked to the chemical manufacturers to emulate their forebears the alchemists—by transmitting base raw material into golden dollars.

DEVELOPMENT OF A NEW EXPLOSIVE

Safety Without Sheathing

A VALUABLE development in coal mining explosives is represented by the recent introduction of the explosive Unibel, manufactured by Imperial Chemical Industries, Ltd.

No explosive may be used in a gassy or dusty coal mine until it has been tested by the Ministry of Fuel and Power and proved to reach a defined standard of safety as regards the hazards of ignition of firedamp and coal dust. Those accepted are certified as "Permitted Explosives." As an additional safety measure, "Sheathed" Permitted explosive was introduced in 1934. In that category, each cartridge is enclosed in sheath of inert material which is dispersed on detonation and serves to reduce still further the risk of firedamp ignitions.

New Classification

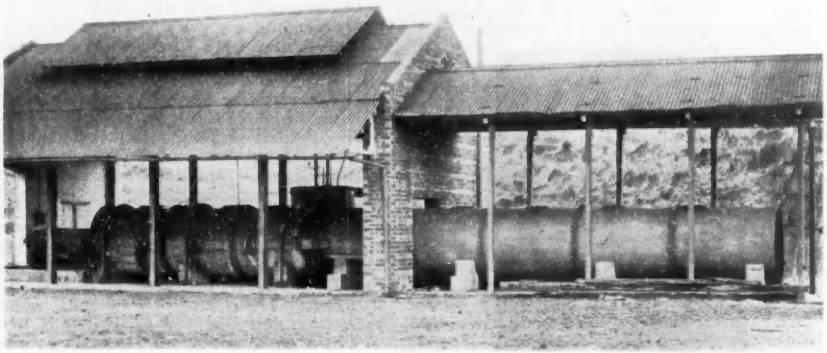
The new Unibel explosive is designed to be equivalent in safety and performance to a Sheathed Permitted Explosive (Polar Dynobel No. 2). This has been recognised and certified by the Ministry of Fuel and Power and, as a result, a new classification of explosives for coal mining—"Eq.S" (Equivalent to Sheathed)—has been introduced. This will be applicable to any future explosive proved to be equivalent in safety to a sheathed explosive of the same group.

The new development has arisen out of many years' investigations into the factors affecting the safety of explosives when fired under different conditions in presence of methane-air mixtures. It has been the subject of prolonged testing, both at the Ardeer testing station of I.C.I., Ltd., and by the Safety in Mines research and testing branch of the Ministry of Fuel at Buxton. The equivalence in safety has been assessed by a wide range of gallery tests carried out in methane-air mixtures.

Laboratory tests have shown that its overall strength is similar to that of Sheathed Polar Dynobel No. 2 and practical tests in coal mines have proved that the blasting results are also very similar.

The nature of Unibel can best be described briefly by saying that the cooling material which would normally be contained in the sheath is incorporated directly and uniformly into the explosive itself. Having no sheath which can be stripped off, accidentally or otherwise, to the detriment of the safety of the charge, is a marked advantage.

The research work and the fundamental studies leading to the introduction of this new type of explosive were described in a paper delivered by Dr. J. Taylor, research director of the Nobel Division of I.C.I., Ltd., to the Mining Institute of Scotland in Edinburgh last month.



[Courtesy, I.C.I., Ltd.

The explosive is fired from the cannon (left), into an atmosphere of methane and air, so that the test reproduces the effect of a "blown out" shot in a coal mine

THE CHEMIST AND RUBBER CABLES

*Development of Organic Accelerators of Vulcanisation**

by B. B. EVANS

FOR an understanding of the technology of rubber and allied materials the chemist must reinforce classical organic chemistry by modern physical conceptions. The reason for this is that, while the former will explain some of the properties of natural and synthetic rubbers, the physical properties on which the technology of the materials in the factory and their subsequent use depend are a consequence of their long chain structure.

Rubber in its raw state is tough and relatively intractable, due to the interweaving of the long chains; its softening by mastication, which is a necessary preliminary to the incorporation of vulcanising and other ingredients, is due essentially to chain shortening by oxygen fission. Subsequent vulcanisation, in which the compound is changed from a plastic to an elastic state, arises from the cross-linking of the chains by the vulcanising agent, usually, but not necessarily, sulphur, so that the chains resist deformation, and return to their original position when the deforming force is removed.

Somewhat similar remarks apply to compounding and reinforcing agents, for although these must be free from undesirable chemical constituents, *e.g.*, copper and manganese, which would catalyse oxidation, and electrolytes in the case of ingredients intended for dielectrics, the basic reason for which compounding ingredients are used is to impart special physical characteristics to the compound. All these effects again depend on the particle shape and size and nature of the surface of the materials.

Organic Accelerators

Improvements in rubber cables have arisen from chemists' work in the development of organic accelerators of vulcanisation, anti-oxygens, and the development of various types of carbon black for reinforcement.

It is probable that organic accelerators function by modifying the nature of the sulphur/carbon linking, but the practical results which follow their use are that rubber/sulphur ratios can be much reduced, and the time of vulcanisation considerably shortened. These, in their turn, tend towards better ageing of the vulcanised rubber, and less effect on the tinned copper conductor.

Organic accelerators for dielectrics must be chosen with care, however, so as to avoid decentralisation of conductor during the early stages of cure, adhesion of vulcanised rubber to the conductor, which would lead to difficulties during installation of cable and the lowering of insulation resistance below values specified in Institute of Electrical Engineers' wiring rules and B.S.7.

Preventing Oxidation

Deterioration in both electrical and physical properties of rubber arises from oxidation. In certain types of installation this can be countered by preventing access of air to the rubber, but the more general step is to include an anti-oxygen in the compound, β-naphthylamine being a common example. It is believed that these decompose the peroxide formed in the early stages of rubber oxidation, and so prevent the subsequent chain reaction.

A big improvement in the protection against mechanical damage imparted by heavy duty sheathing used on trailing cables for mines has followed the replacement of earlier mineral reinforcing agents by the various grades of carbon black, this being due principally to the very small particle size of the latter.

There is no product commercially available which is synthetic rubber in the sense of being a man-made reproduction of the natural product. Most of the so-called synthetic rubbers are more correctly described as long chain polymers, usually amenable to similar manufacturing technique to that employed for natural rubber, produced from monomers chemically related to butadiene, but often containing substituent or additive chemical groupings which confer superiority over natural rubber in particular respects, such as resistance to oil, fire and weather.

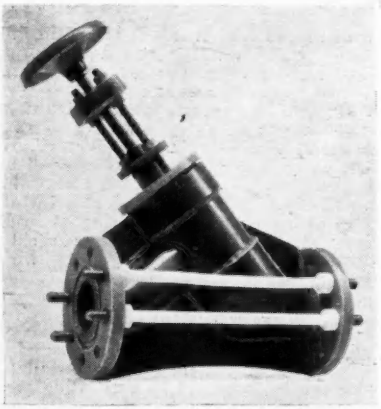
During the war, some of these, notably a special washed dielectric grade of American GRS (butadiene/styrene copolymer), polychloroprene (polymerised chloro-2-butadiene) and thiokol (ethylene tetrasulphide produced in this country), were used as substitutes for natural rubber following the loss of Malaya. The

(*Continued overleaf*)

* Summary of paper read before the London and South Eastern Counties Section of the Royal Institute of Chemistry.

PVC Chemical Equipment

Promising Alternatives to Metals



[Courtesy, Tanks & Linings, Ltd.

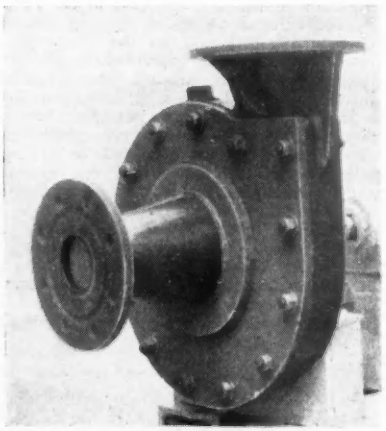
Examples of plastic pumps (above and right), made from PVC

ONE of the practical benefits accruing from the post-war use of German technology is exemplified by the production of a wide range of chemical appliances, vessels and ducts employing completely unplasticised polyvinylchloride, the German form of which (Vinidur) found much use during the war.

A British equivalent, Nutradur, has now been fully developed and has been found to be exceptionally adaptable and highly resistant. Among its more promising characteristics are the readiness with which it can be fabricated into relatively intricate forms and the consequent economy which that permits. These qualities are especially helpful in the production of valves and pumps, in which the thermoplastic synthetic may in a number of cases replace more expensive materials, such as deal alloys and stainless steel. The unplasticised resin is stated to have very high shock resistance and to be unaffected by most chemicals, other than solvents.

Adaptable Material

It is a considerable advantage that the material is most amenable to processing; it can be sawn, dulled and machined, welded by hot air torch and formed into almost any simple shape by heat treatment (about 120°C.). Tensile strength is around 9000 p.s.i. at 15°C. and compressive strength some 10,000 p.s.i. The specific gravity of this form of PVC is 1038, thermal conductivity 3 by 10^{-4} cal./sec. Cm^2 °C.cm. Water absorption is stated to be 0.5 per cent in 24 hours and the dielectric constant at 1 mc./sec. 3.2 to 3.4.



THE CHEMIST AND RUBBER CABLES

(*Continued from previous page*)

only one now used, however, is polychloroprene, in which the chlorine content renders the material self extinguishing and oil resistant.

Examples of its use are as a component of a fire-resisting dielectric in ship-wiring cables; it is used in place of natural rubber for the fire-resisting, heavy-duty sheath on trailing cables in coal mines, as a body fat-resisting sheath for miners' cap-lamp flexibles, and as a fire- and oil-resisting covering on aircraft cables.

The latest silicone rubbers, although being very weak mechanically, have extremely good resistance to temperatures even of the order of 150°C., due to the silicone/oxygen linking of the backbone of the long chain polymer, and are finding special applications in high temperature ignition cables for aircraft and the wiring of brick kilns.

MICROCHEMICAL BALANCES

*Their Essentiality Recognised in Nottingham Symposium**

THE essential function of the microchemical balance in the work of all microchemists was recognised in the course of a symposium in Nottingham last month, intended to make more widely known current problems associated with their design and use and the contribution which the laboratory worker could make to their solution.

The subject was introduced by Dr. G. E. Hodsman (L. Oertling, Ltd.) who urged that the microchemist should be familiar with the principles underlying the construction of the microchemical balance. Only then could he obtain more efficient service from the instrument and also make the manufacturer familiar with his more detailed requirements, a *sine qua non* for the advance of balance design.

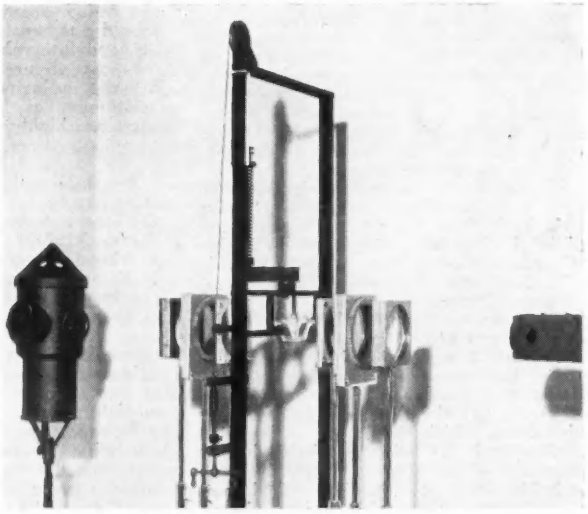
The formula relating the sensitivity of a balance to the position of the beam at equilibrium is fundamental to the whole design of the instrument. It can easily be shown from this formula that in the first place the central knife edges and the knife edges at the ends of the beam should lie in one straight line.

For increased sensitivity the beam arms should be as long as possible, while the total weight acting and the distance between the point of support of the beam and the centre of gravity of the system should be as small as possible. However, increase of the former increases the time of swing, so that a compromise must be made between a high sensitivity and a reasonably short time of swing.

Again, undue increase in beam length and in total assembly weight will affect the rigidity of the beam, incurring the risk of throwing the knife edges out of alignment. Once again a compromise is reached. Any demand for a new factor in beam design will probably necessitate a complete readjustment so as to reach a new compromise between all the variables.

Study of the wear between balance bearings is virtually in its infancy. It is known that the bearings must be hard, flat and and highly polished, while the ideal knife edge is infinitely thin. On wear, crushing of the knife edge takes

* Report of a joint meeting at Nottingham, Sept. 22, of the Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists and the East Midlands Section of the Royal Institute of Chemistry.



Model of beam in position on loading frame of photoelastic test apparatus for stress analysis of balance beams

(Courtesy of L. Oertling, Ltd.

place, resulting in the formation of debris which fouls the bearing, leading to lack of reproducibility. In addition, the adjustment of the knife edges relative to each other is affected. It is now realised that in addition to possessing elasticity, the knife edge should be softer than the bearing plane.

Study of the importance of the rider bar and rider reveals two independent sources of error. The notching of the rider beam must be accurate to within 0.0005 in. to achieve reproducibility of 1 microgram. Progress has been made in this direction by the use of a tool which cuts all the notches simultaneously, rather than *seriatim*.

Dislocation Error

More troublesome is the possibility of dislocation error in lifting and replacing the rider. Indeed, the majority of weighing errors on the microchemical balance can be attributed to this. If the rider is not placed at the bottom of the notch to within 0.0005 in. an error of 1 microgram or more will result. In addition, the rider must not deviate from the normal to the beam by more than 10-12 minutes of arc, or an error of the same magnitude will result.

Possibly the best type of rider from the point of view of elimination of these errors is the quartz stick rider, but it, in turn, is open to objections on the grounds of difficulty of manipulation.

The beam must be highly resistant to corrosion, non-magnetic and free from strain. An interesting new development is the introduction of photo-elastic stress testing, using plastic models. The interpretation of the stress patterns is complex, but stress-free portions of the beam may be removed, thus leading to the construction of lighter beams.

The setting of the knife edges on the beam is highly critical. On a 5-in. beam each knife edge is set to within one-millionth of an inch. The difficulty of this adjustment becomes more obvious when it is realised that the setting is a three-dimensional one.

One point of importance both to the manufacturer and to the user is the disagreement of terminology in the manufacturers' literature. In specifying the performance of a balance two factors should be given; (1) the deflection in mm. per microgram, which should be as large as possible and (2) some precisely defined indication of the reproducibility, such as probable error or standard deviation. Microchemists are entitled to demand that manufacturers should clarify these points and place specifications on a firmer basis.

Anticipated future developments are naturally largely concerned with increase in accuracy, particularly in the weighing of small samples. It is not impossible that there may be complete abandonment of the rider principle and the calibrated graticule in favour of other methods. The quartz fibre technique of construction is also full of possibilities, while the application to weighing of a considerable range of physical principles, such as those used in electromagnetic balances and nuclear detectors, has already received some attention.

Mr. David W. Wilson (Sir John Cass Technical Institute) dealt with Maintenance and Precision of Mircobalances. Many users of microchemical balances are doubtful how far the maintenance of the microchemical balance can be provided on the spot, and how far it must be delegated to the manufacturer or supplier.

Briefly, it is accepted that the user should be capable of adjusting zero point, and also, if required, sensitivity. The latter operation, however, is tedious, and any serious deterioration in the sensitivity almost certainly indicates that the knife edges are at fault, and require expert attention.

Dismantling, cleaning and reassembling also fall within the user's province; this, however, should be carried out only when the precision of the balance falls outside the value required for the work, and should not constitute a routine operation at fixed intervals.

In no circumstances should the user attempt adjustments which involve the positioning of knife edges and planes; these are highly skilled operations.

Precision

The published work on the precision of the microchemical balance has not received the attention due to it. Since the microchemical balance is being used practically to the limit of precise functioning, the precision factor becomes a highly critical one in analytical operations.

Some measure of the spread of results over a series is required. The distance between the maximum and minimum values is not sufficient, since it takes no account of the variations in the intermediate results.

Probably the fairest estimate of producibility devised by statisticians is the standard deviation, although some workers prefer the probable error, which is 0.675 × standard deviation. For comparison of the performance of different

balances there is, however, no need to apply the factor.

In addition, from standard deviation, σ, it is possible to determine directly the probability that future weighings performed under the same conditions will lie within certain multiples of σ. For example, 95 per cent of these should lie within $\pm$ 2 σ, while 99 per cent should lie within $\pm$ 2.6 σ and 99 per cent within $\pm$ 3 σ. In chemical work the first of these, $\pm$ 2 σ, which indicates that 19 out of 20 results will probably lie within the limits, is usually preferred.

If on a series of straightforward weighings, σ = 1.15 microgram, then 95 per cent of future weighings should lie within $\pm$ 2.3 micrograms. This affords some measure of precision, and hence of confidence limits. Consequently, we can derive the sample weight which will probably give a result falling within a desired error.

It must be remembered that the weighings must all be carried out under precisely the same conditions. Since weighings are in practice usually accompanied by a determination of the zero point, we are normally dealing with the difference of two weighings, both subject to the same type of random error.

If we assume the standard deviations for each set to be the same, then we can show that the total standard deviation for the difference is $\sqrt{2}$ × standard deviation for one of the sets. The limits for the case quoted above now become $\pm$ 3.2 micrograms.

In summing up, four points may be made: (1) A standardised definition of precision is lacking; (2) There is not yet a correct evaluation of the definitions of precision used; (3) There is no standardised procedure for the determination of precision; (4) Manufacturers should quote some clearly defined measure for precision for their balances. This would help both the manufacturer and the user.

The Quartz Microgram Balance

The Ultra Microbalance, of which a beam assembly was exhibited at Nottingham, was discussed by Dr. C. L. Wilson (Queen's University of Belfast).

It has been shown that the limits of ordinary kinetics of reaction are at least as low as 10^{-16} to $^{-20}$ g. Consequently chemical operations in the range of 10^{-6} to 10^{-9} g. need take no account of any alteration in the type of reaction. Only proper manipulation and observation are required for the study of ordinary analyical reactions on this reduced scale.

This range has latterly become of considerable importance both in the chemistry of the trans-uranic elements and in many fields of applied analysis where hitherto only qualitative or semi-quantitative observations were possible.

The more important ultra-micro or microgram balances so far devised can be grouped in five broad categories; the displacement type introduced by Salvioni: the torsion-displacement type, of which the Nernst balance was an example: the beam and knife edge type employed by Steel and Grant: the helix type such as that of Bang: and the torsion-restoration type first introduced by Neher and recently improved by Nirk and his co-workers.

The last, which has a much more favourable relation of load to sensitivity than any of the others, seemed the best one on which to base the construction of a simple laboratory model.

Kirk's Balance

The balance of Kirk and co-workers employs an all-fused-quartz beam construction which has all the advantages of these systems for which they were first chosen by Steele and Grant. However, the necessity for fused joints in the extremely fine fibres renders the construction a very difficult operation requiring elaborate and expensive equipment.

In the balance in operation at Belfast this difficulty was overcome by the use of cemented joints. Such joints have not so far shown themselves to be the source of any serious decrease in efficiency.

Certain other minor modifications were made in the Kirk balance, and the thickness of the torsion fibre was decreased from 23 μ to 15 μ.

A sensitivity of 0.002 microgram per minute of arc is obtained, and a maximum load of at least 390 micrograms. It is not possible to read, with the present inferior optical system, to less than about 35 minutes of arc, and a standard deviation of 0.04 microgram is therefore the best value recorded.

The performance cannot be compared with that of the Kirk balance, since the various figures quoted by them cannot be evaluated properly, and, indeed, conflict within themselves. As far as can be judged, however the performance compares favourably, while the cost of such a balance is but a fraction of that at present marketed in the U.S.A.

A reasonably accurate quartz torsion-restoration ultramicro balance can therefore now be regarded as an instrument within the reach of the ordinary well-equipped microchemical laboratory.

MANUFACTURE OF VERY TOXIC CHEMICALS

*Plant Design and Operation**

by S. B. CORMACK, M.A., D.Sc., Ph.D., F.R.I.C.

CHLORINE is today a familiar and widely used chemical. It goes all over the world in cylinders and drums. It is carried about in many countries in road and rail tank wagons of capacities of seven tons, 14 tons, or higher.

Accidents are very rare. Yet in the early days of its use chlorine was transported and used in the form of bleaching powder because that was considered to be the only safe means of handling it; and it was a dreaded poison gas in the 1914-1918 war. [Again, that very powerful poison—hydrocyanic acid—or Prussic acid as it was popularly called, was only mentioned at one time when it or its salts were used by would-be suicides, yet its salts are now extensively employed in heat treatment baths, and the acid itself is a well known fumigant and a starting material for many commercial products, including for example, "Perspex."]

Hazards Overcome

Tetraethyl lead in its pure form is extremely poisonous, yet it is now manufactured with perfect safety in large quantities for admixture with other materials to give special fuels. Nor can we omit to mention the field of atomic energy, where a completely new world of hazards and problems is being faced and overcome.

This is a feature of modern chemical industry. It has found means of producing, in ever increasing measure, materials which at one time were considered impossible to make and to use in quantity, because of the hazards involved in handling them. The nature of the materials has not changed, but our understanding of them, and of ways to deal with them has so increased, that there is now no material which cannot be made and handled in safety provided—but always provided—that we know what precautions are required, and that we observe these precautions at all times.

Toxic materials may be described as those which act on the bodily mechanism in such a way as to cause interference with the normal functions and structure, leading to temporary or permanent disability and death.

Except for specialised purposes such as fumigants and pest control agents, we do not make chemicals because they are toxic. We make them for use as solvents, as refrigerants, as cleaning agents, as important intermediate compounds for chemical manufacture.

The importance of knowing the minimum lethal dose is accepted, but nowadays it is realised that from the point of view of industrial health, there is frequently a much more subtle effect due to long continued exposure to extremely low concentrations which appear, at first, to be so slight as to be negligible.

If we propose to manufacture toxic chemicals, we must be prepared to take precautions against materials which can cause immediate death in some concentrations and lead to serious and ultimately fatal disorders by exposure to lower concentrations.

These effective concentrations are frequently extremely small. A concentration of 50 p.p.m. HCN for a few minutes will cause serious injury or death. A concentration of 10 p.p.m. phosgene is fatal in a matter of minutes, and a concentration of one to two p.p.m. will produce serious lung effects after less than half an hour's exposure.

Delayed Effects

Mustard gas is a good example of delayed action. Nothing happens at the time. Again, in the case of phosgene there is an immediate effect of choking and coughing, from which the patient recovers and indeed, has a feeling of well being. But if allowed to return to normal duties he may well collapse and die some hours later when the lungs fill up with fluid as a secondary delayed effect. Undue exposure to nitrous gases gives a similar result.

The effect of these complications on the organisation and operation of the factories handling such materials can be appreciated. Workmen will face up to many risks with perfect equanimity when the result of a mistake is immediate retribution; they do not so readily settle down to a job where the consequences of an

* Abstracted from the paper presented before the North Western branch of the Institution of Chemical Engineers in Manchester on October 8.

error may come many hours afterwards, when they are at home or in the pub with their mates. And the more imaginative and intelligent they are, the more do they feel the shadow of not being sure.

If we are contemplating the manufacture of very toxic materials, we must therefore have in mind the extraordinarily low concentrations at which they can act, the very insidious effects of delayed action, and the wide range of maladies which they can produce.

We might add, in conclusion, the very varying susceptibility of different individuals which cannot be predicted. Just as it is often the big healthy, strong looking fellow who gets seasick while his thin, emaciated companion remains unmoved, so one workman may collapse in a concentration where others have worked maybe for years without any effect. Before attempting to build plants for the manufacture of toxic materials we must have the best medical advice we can get; we must be given some figures for toxic concentration, and we must plan accordingly. If we do not, we may find that a full scale plant has been erected and operated, when suddenly a succession of illnesses or maybe fatalities causes production to be stopped and a complete redesign of plant is required before manufacture can be restarted. And when it does restart, the plant has a bad reputation.

Distant Control

The problem of the manufacture of toxic materials, thus becomes one of isolating the plant so that the ingredients get no opportunity to affect the workers; of designing so that the operation can be controlled at a distance; of making arrangements so that maintenance is reduced to a minimum, and when it is necessary, of so conducting it that the hazards to those concerned are reduced to a minimum; of ensuring that all effluents are rendered innocuous before disposal, and of building up the organisation to do this; workers, supervisors, medical and safety arrangements. It is no more than that—but no less than that either.

[The author went on to describe, with illustrations, what is involved when a joint ring has to be replaced in a system carrying (a) water; (b) a normal chemical, such as sulphuric acid; and (c) a highly toxic low-volatile liquid such as mustard gas. The first might be carried out in about 30 minutes without risk; the second in about an hour with little risk if the normal precautions were observed; the third would require about three hours' work involving the most elaborate safeguards and full protective clothing and the collaboration of specialists to supervise both the work and the measures to safeguard those performing it.]

Such considerations are fundamental to the design and operation of these types of plant, and the designer and plant manager must get into their heads the realisation that the plant must be constructed so as to require the minimum of adjustment and repair, because even the simplest repair job will take an hour or more.

Avoiding High Pressures

In considering the design of the plant we should start first by looking at the process itself. All possible routes to the final product should be examined, and if we have any choice of process we should choose the one that avoids high pressures and fractional distillation, that gives the minimum of effluent, and that avoids filtration processes.

Particular attention should be paid to selecting a process in which the "toxic stage" is reduced to the minimum. For example, instead of purifying the final product by distillation it may be possible to achieve the same result by purifying some, or even all the non-toxic starting materials. Even although this may require, at first sight, more equipment and more labour, it will be additional work under non-toxic conditions and will, in the end, give an overall reduction in the man hours required to operate the process and maintain the equipment.

The normal layout involves enclosing the "toxic" section of the plant in cubicles and the plant items should be laid out, as far as possible, for transfer of toxic liquids by suction. Transfer of liquids by suction means that any leaks are into the plant and not out of it, and if a pipe should fracture, the flow stops, whereas if compressed air or pumping has been employed, the flow of liquid will continue until the motive power is shut off. Where pumps have to be used the submerged verticle spindle type is to be preferred, since the glands have to be sealed against vapour and not liquid. But don't expect to draw such a pump out of the toxic liquid every week for routine maintenance!

All the intermediate and final storage tanks must be fitted with some type of device to show how much material is in them at any time. It is important to know this, not only to measure efficiencies and observe the general flow and prevent overfilling, but because the quantities of

toxic material must always be carefully checked. Any unaccounted loss means that some material has got out of the system, and until discovered it is more dangerous than a tiger escaped from a zoo.

It is advisable to have all the joints at the top of the vessel so that they will be in contact with vapour and not liquid. Bottom run off connections are generally to be avoided because it may mean having to repair a joint or a valve with a head of toxic liquid above it.

None of the valves inside the cubicle can be regularly operated by anyone going inside, so that either the pipe carrying the fluids has to be brought to the front of the cubicle and operated by a man just putting his hand inside, or distance controls must be used. Examples of both these methods will be seen on the lantern slides which we shall look at presently.

The layout of the pipe work under these conditions is entirely different from that normally followed, and the draughtsmen concerned must be very carefully trained and supervised in order to make sure that all the pipes are arranged to give suitable access to valves and to avoid "pockets" where toxic material will continue to lie when the pipes are drained. A method adopted successfully in some toxic plants is to install the plant items and then "run" the pipe connections on site.

As far as possible, electric motors should be kept out of the cubicle. Think what happens when toxic material gets spilled on them, or when they get saturated with toxic vapours which condense on the windings. Even totally enclosed flameproof type motors "breathe" and suck in vapours when they cool down after running.

(*To be continued*)

*Chemistry of Plastics and High Polymers**

A book of this kind and calibre has long been needed. It is written chiefly from the standpoint of an organic chemist. The author, head of the department of chemistry in Birmingham Central Technical College, treats his large subject thoroughly, skilfully and lucidly. As an introduction to high polymers, the book can be recommended to students of B.Sc. standard and to post-graduate chemists in industrial or university laboratories.

Introductory chapters contain an account, mainly qualitative, of high polymer formation and structure. The succeeding portion, comprising about one-third of the book, gives a concise survey of all the main synthetic species, subdivided into addition polymers, the polyester, polyamide, and polyether group, phenoplastics, and aminoplastics. A further series of chapters, occupying a similar proportion of the book, describes naturally occurring polymers, particularly proteins, cellulose, and rubber, with briefer accounts of lignin and drying oils. Another chapter deals with inorganic polymeric substances, such as mineral silicates, glasses, and graphite; silicones are included. Finally, there is a brief account of physical properties in relation to structure, which incidentally serves to correlate some of the data of earlier chapters.

Arbitrary technological classification is rightly subordinated to chemical relationships and to considerations of the size, shape, and intermolecular attractions of polymer molecules. Thus, rubbers from butadiene and chloroprene are considered with polyvinyl plastics, while Thiokol rubbers and fibre-forming polyamides appear in the same chapter as alkyd resins and shellac. Few recent developments, up to 1948, are overlooked, e.g., a clear account of recent German work on the structure of phenol-formaldehyde plastics is given, redox polymerisation systems are described, and α-methylene activity in rubber and drying oils is discussed. Accurate references are made to some of the more important manufacturing processes and industrial applications in which the various polymers are concerned.

The writing and the printing of the book are both excellent. It contains few printer's errors and it is adequately indexed. A few factual errors were noted, e.g., Neoprene is wrongly classified as a British rubber (p. 64), emulsion stability appears to be confused with gelatin in solution (p. 34), and tetramethylthiuram disulphide is given a wrong formula (p. 185). Numerous condensed references (author and date) are incorporated in the text. These, together with book references at the end of each chapter, greatly enhance the value of the work for readers seeking more detailed information.—R. G. R. B.

* CHEMISTRY OF PLASTICS AND HIGH POLYMERS. Patrick D. Ritchie, B.Sc., Ph.D., F.R.I.C. 1949. London: Cleaver-Hume Press, Ltd. New York: Interscience Publishers, Inc. Pp. 288. 25s. net.

POTENTIAL RIVAL OF DDT

Successful Results with Chlorinated Camphene

JOINING the ranks of new organic insecticides, such as DDT and the gamma isomer of benzene hexachloride and chlordane, is chlorinated camphene.

This compound, having the approximate empirical formula $C_{10}H_{12}Cl_8$, is made up of several isomers, all of which possess outstanding insecticidal properties. The commercial grade of chlorinated camphene is an amber, waxy solid possessing a mild, pleasant odour. It melts in the range of 70° to 95°C.

Many inexpensive commercial solvents, such as acetone, carbon tetrachloride, xylene, kerosene, deodorised kerosene and fuel oil, will dissolve chlorinated camphene, which is equally solube in aromatic and aliphatic hydrocarbons. The heat required to raise the temperature of this insecticide is 0.257 to 0.028 cal./gm./°C. over the temperature range 25° to 162°C. The density of chlorinated camphene decreases from 1.66 gm. per ml. at 27°C. to 1.57 gm. per ml. at 150°C.

This new insecticide possesses an acute oral toxicity, greater than DDT, benzene hexachloride or chlordane. The mean lethal dose of chlorinated camphene is 60 mg./kg. of body weight; comparable figures for DDT, gamma isomer of benzene hexachloride, and chlordane are 250 mg./kg., 125 mg./kg., and 500 mg./kg., respectively.

Toxicity

The sub-acute, or chronic toxicity of chlorinated camphene is lower than that of the other insecticides mentioned. Its killing power and effectiveness are due to the combined action of contact and stomach poison effects. Studies on the influence of chlorinated camphene on warm-blooded animals show that it is an effective stimulant of the central nervous system in the mouse, rat, guinea pig, dog, calf, goat and sheep. The lethal does causes generalised convulsions and death due to respiratory failure.

Chlorinated camphene, or its chlorinated metabolite, appears to be stored in fat tissues when given in sub-lethal doses and is only slowly excreted or otherwise removed from the body.

The material, which is also known as toxaphene, is non-injurious to a wide variety of plant species, but causes severe injury to squash, cucumber, melon and other cucurbits, particularly to young plants under conditions of high humidity. Experiments are proceeding to determine the effect of this insecticide on the soil, but preliminary work rather indicates that it is broken down in the soil by micro-organisms and rendered harmless within a short time.

The importance of insect control in cotton growing is now being more fully appreciated and, during recent years, publicity has been given to the losses suffered yearly due to the depredation of insects; this amounts to an average of about 15 per cent, or one bale out of seven.

Cotton Insects

So far, toxaphene has found its principal use in controlling the cotton plant insects. During 1948, the first year that it was commercially available on a large scale, more than 30 million lb. of toxaphene dusts and sprays were used by American farmers to combat cotton insects, grasshoppers, the army worm and other pests.

Many of the leading cotton-growing states of the U.S.A. are now using 10 lb of 20 per cent chlorinated camphene for each application per acre against the boll weevil, boll worm, cotton aphid, cotton leafworm and Southern green stink bug. For the cotton flea hopper, rapid plant bug, tarnished plant bug and thrips, 10 lb. of 10 per cent per application is recommended. Where the red spider is present, it is necessary to include at least 40 per cent conditioned dusting sulphur in a toxaphene formulation

Chlorinated camphene is also effective for controlling grasshoppers, when applied at the rate of 1.5 to 2 lb. per acre. When properly applied, the period of effectiveness ranges from 5 days to 2 weeks, depending on vegetation, climatic conditions, etc.

The insecticide contains from 67 to 69 per cent chlorine. Several methods have been standardised for the determination of total chlorine in toxaphene and its formulations. The chlorine is split out by treatment with metallic sodium and isopropyl alcohol, as in the U.S. Department of Agriculture's method for DDT, and titrated by the Volhard method using the nitrobenzene modification. Insecticide manufacturers in the U.S.A. report that this has been found to be the most convenient method for control work.

· PERSONAL ·

THE Lord President of the Council has appointed MR. A. H. WILSON, MR. A. H. S. HINCHCLIFFE, LORD HALSBURY and PROF. R. S. EDWARDS to be members of the Advisory Council for Scientific Research for five years from October 1. The new members succeed Mr. W. F. Lutyens, Mr. W. J. Drummond, Sir Henry Guy and Sir William Halcrow, who have retired on the completion of their appointments. Mr. A. H. Wilson combines university and industrial experience in science. In 1945 he became director of research and development of Courtaulds. Mr. A. H. S. Hinchliffe, governing director of Glazebrook Steel and Co., cloth merchants and exporters of Manchester, has been chairman of the Manchester Joint Research Council and was largely responsible for its creation. He is a director of the Manchester Royal Exchange and a local director of Barclays Bank. Lord Halsbury is managing director of the National Research Development Council. Professor R. S. Edwards is an economist who has recently made a comprehensive study of research associations.

LORD BOYD-ORR, chancellor of Glasgow University, has been chosen from 23 candidates as winner of the Nobel Peace Prize for 1949. Lord Boyd-Orr stated that any money he received from the award would be devoted to the furtherance of his world food plan and to encouraging greater co-operation between nations for increasing the fertility of the land.

MR. H. COLLACOTT, who has been a member of the staff of The Evans Biological Institute since it was opened in 1902, has retired after 47 years' service. Also retiring is MR. J. HAMPSON, who has been a chemists' representative for the company in the North for 28 years, and has served, in all, for 46 years. MR. H. FARDON, who was manager of Charles Midgley, Ltd., a company in the Evans group, has also retired after 28 years' service.

MR. WILLIAM WISHNICK, son of Mr. Robert I. Wishnick, president of the Witco Chemical Company, New York, and MR. HAROLD A. WILSON, son of the late Mr. Harold Wilson, a well-known figure in the colour and chemical industry, have been appointed to the board of the Witco Chemical Co., Ltd., London.

DR. R. A. V. RAFF, specialist in high polymer research, has been appointed to a new fellowship on plastics established in the Mellon Institute by Koppers Company, Inc. Dr. Raff was previously in the employ of the Howard Smith Paper Mills, Ltd., Cornwall, Ontario.

These officers were elected at the recent annual meeting of the Atomic Scientists' Association: President, PROF. R. E. PEIERLS; executive vice-president, DR. K. LONSDALE; hon. general secretary, DR. C. CHAMPION; hon. treasurer, DR. F. C. PICKOVANCE; editor of the Association's journal, DR. J. L. MICHIELS; librarian, DR. W. D. ALLEN.

MR. P. CATTERMULL, whose retirement from the general managership of the Tudor Accumulator Co., Ltd., is announced, has spent 30 years with that company, as secretary, director and general manager, and from October 1943 until the present time as chairman. He will, at the invitation of the board, continue as chairman.

The Melchett Medal for 1949 for outstanding achievement in work involving scientific preparation or use of fuel was presented to AIR COMMODORE SIR FRANK WHITTLE last week at the annual dinner of the Institute of Fuel.

MR. W. J. INTIN, assistant manager of the Scottish Co-operative Wholesale Society's soap works at Grangemouth, has been co-opted to the Grangemouth Town Council. The Provost of the town, Mr. J. Penny, is manager of the soap works.

Kemball, Bishop & Co., Ltd., Crown Chemical Works, Bromley-by-Bow, London, E.3, announce that, owing to ill health, MR. W. CASH has resigned from the board of the company, of which he has been a director for over 20 years. He was chairman from 1934-1948.

BSIRA Library

A catalogue of books in the library of the British Scientific Instrument Research Association has been compiled by Miss J. M. Fulford, until recently its librarian. The catalogue (62 pages), comprises a classified list in accordance with the Universal Decimal system, and alphabetical indexes of authors and subjects. It is complete up to March, 1949, and supplements will be issued at intervals in the *Bulletin* of the association.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

PROGRESS of one of the largest man-made fires, burning underground in the Gorgas mine, 55 miles northwest of Birmingham, Alabama, as part of the United States experiments in coal gasification, is being followed by means of an electronic mercury-vapour detector. The fire, is in the Alabama Power Company's Gorgas mine, where subterranean gasification experiments are being conducted by the U.S. Bureau of Mines and the Southern Research Institute. At regular intervals through the vein, small capsules of mercury have been placed in the path of the fire. The mercury-vapour detector records the gases emitted from the mine, as well as mercury vapour, the occurrence of which records progress of the fire along a seam. The mercury-vapour detector makes use of the fact that ultra-violet light is scattered when it passes through an atmosphere containing mercury vapour. The detector is not affected by carbon monoxide and hydrocarbons.

* * *

At a meeting of the Minnesota section of the American Chemical Society, Dr. W. E. Lundquist, of the Minnesota Mining and Manufacturing Company, predicted an expanding market for plastics materials and said that the American plastics industry, which had a record production of almost 1500 mil. lb. last year, was doubling its output every three years. There was every reason to expect that production would continue to rise rapidly for some time in view of the fact that there were several relatively new fields in which plastics promised to become more and more a part of everyday existence. New synthetic fibres similar to nylon constituted one of the most important of those fields, and in the next few years one could expect to see others which would take over some of the clothing uses previously largely monopolised by wool. There was a tremendous market for textile materials, and many of the larger chemical companies were spending vast sums for the development of those new synthetic fibres. Of the new plastic materials, one of the most promising was polyethylene.

* * *

Utilising the combined research facilities of both companies to promote developments and new processes in the field of phenol and derivative chemical products, Reichhold Chemicals, Inc., of Detroit, Michigan, and the Diamond Alkali Company, of Cleveland, Ohio, have announced plans for a co-operative venture which will see the further development of Reichhold's phenol operations at present located at Tuscaloosa, Alabama. The plant involved in the deal, which uses the sulphonation process, was built by Reichhold in 1943 at a cost of $3.5 million in order to alleviate the wartime shortage of phenol. Under the new plan the physical assets and operation of the Tuscaloosa plant will be transferred to a new Alabama corporation. Diamond Alkali has entered into a financial arrangement with Reichhold which will provide funds for the extensive modification and improvement of the processes principally employed and has also acquired an option to purchase a half-interest in the new Alabama company.

* * *

Coincident with the statement that Lever Brothers Company will move its headquarters from Cambridge, Massachusetts, to New York City on December 1, 1949, to New York City for a $7 million expansion programme for the company's manufacturing operations. Simultaneously, the executive and general offices of Lever's three subsidiaries, Pepsodent Company and John F. Jelke Company, both of Chicago, and Harriet Hubbard Ayer, Inc., New York, will be moved into the new centralised offices in New York.

* * *

A new aluminium welding process, called Aircomatic, which is expected to have a marked effect upon the industrial and job welding of aluminium, has been developed by commercial interests and research at the Battelle Memorial Institute, Columbus, Ohio. The new process is claimed to join aluminium plates ⅛ in. to 3 in. or more in thickness. It is said to be at least four times faster than any previously known process of welding aluminium which produces welds of equal quality, to require less skill than present methods of fusion welding of aluminium, and to be adaptable to semi-automatic and machine operation. No solid fluxes are required, there are no slags to be cleaned from weld joints, and the welder's work is not interrupted to change electrodes.

HOME

National Certificates in Textiles

Since the inception, in 1935, by the Textile Institute and the Ministry of Education of the scheme for the award of national certificates in textiles, the highest number of certificates won in any one year is the outcome of the 1949 examinations. Of a total of 298 students who sat, 230 were successful.

Borax Prices Unchanged

Borax Consolidated, Ltd., announces that, notwithstanding the change in dollar value of sterling, its prices of borax and boric acid are unchanged. The normal demands of its regular customers will be supplied from stocks at prices ruling before devaluation. A further announcement will be made by the company before prices are increased.

U.K. Metal Prices Reduced

A reduction in the price of good soft pig lead by £6, from £111 to £105, a ton delivered, from October 19, was announced by the Ministry of Supply last week. This is the fourth cut since the price was advanced from £34 15s. to £122 on devaluation of sterling. The buying price for rough copper, in slabs of from 2 to 3 cwt. was reduced from £110 to £100 a ton.

Untaxed Fireworks

The Customs authorities, after having consulted with the British Pyrotechnists' Association, have decided that fireworks and fireworks composition generally shall be exempt from purchase tax. Exceptions are "joke bombs" and boxes of assorted indoor fireworks, both of which will be chargeable at 33⅓ per cent. The various categories are set out in the "List of Authorised Explosives" (HMSO, 3d. net).

End of Irish Refinery Scheme

The remaining portable buildings and equipment of the proposed Irish national oil refinery at the North Wall, Dublin, are to be sold. Thus will end the attempt started more than ten years ago to establish an oil refining plant for Ireland's needs and to build up an industry for the export of oil by-products. The scheme was to have been financed with Irish, British and American money. Two companies were formed in 1937 to refine oil and to export by-products. Adequate finance, however, was not made available and there was stated to have been trade union opposition.

Soap Substitutes Freed

Consequent upon the Government decision to remove control from soap substitutes packed for retail trade, the Soap Substitutes (Labelling and Prices) (Revocation) Order, 1949, will come into effect on November 6; this revokes Order No. 638, of 1943.

Better Paraffin

Shell-Mex and B.P., Ltd., announce that their first quality paraffin (White May) will again be on sale to the public on November 1. This step has been made possible by the lifting of Government restrictions, following repeated requests from users who require a fine quality paraffin.

Coal Production

Britain's total output of coal last week was 4,334,900 tons (4,072,600 tons deep-mined, 262,300 tons opencast), compared with 4,240,400 tons (3,993,100 tons deep-mined, 247,300 tons opencast) in the corresponding period last year. There was a slight decrease in production of 6400 tons compared with the previous week's total of 4,341,300 tons.

New Instruments Company

New groups have been formed to control the production operations, at Glasgow, Barkingside and Basingstoke, and the sales and servicing of a wide range of industrial instruments formerly associated with Kelvin, Bottomley and Baird, Ltd., and Henry Hughes & Son, Ltd. The latest organisation is Kelvin & Hughes (Industrial), Ltd., 2 Caxton Street, S.W.1, to sell and service the testing and recording instruments produced by the co-ordinating production company, Kelvin & Hughes, Ltd.

Noxious Gases Legislation

A request that carbon black and lamp black works be excluded from the proposed changes to the Alkali, etc., Works and Regulation Act, 1906, was one of the main features of the public inquiry held by Mr. W. A. Damon at Caxton House, London, on Tuesday last. Manufacturers of carbon black stated that it was being produced in this country by a secret process evolved in the U.S.A., and that it was feared the inspectors might require information which the English producers were prevented by their covenant from disclosing.

OVERSEAS

Indo-China Fertiliser Project

A local nitrogen and phosphate fertiliser industry is proposed in Indo-China as part of the ten-year plan established by the Government. Doubt has been expressed whether it will be possible to realise in 10 years all the projects proposed, bearing in mind the shortage of foreign currency.

Water Problems of U.S. Industries

A series of lectures on various water problems of the process industries is to be given on November 17 at the third annual autumn symposium of the New York section, American Institution of Chemical Engineers. Subjects to be discussed include substitution of air or seawater for surface water cooling towers, water treatment to reduce sealing, applications of compression distillation, and an overall surey of the economics of supplying water to the plant.

Priority to Polish Chemicals

The current Polish six-year plan proposes that production by the chemical industry shall be doubled in relation to present production figures. Twelve per cent of total capital investments are to be devoted to the chemical industry and mines, the major part to be used to reconstruct and develop plants in the ex-German region which will provide 30 per cent of total chemical production, including many products which were not made by Poland in 1939. The Moscisce nitrogen plant, which was seriously damaged, is now working at reduced capacity; in 1950 the Auschwitz plant will be under full production.

Canadian Coal Tar Products

Output from the coal tar distillation industry in Canada during 1948—the Bureau of Statistics reports—was valued at $8,077,247, 27 per cent more than in 1947. Production of creosote oils in 1948 totalled 11,044,351 gal. worth $2,678,993; refined tars amounted to 2,443,658 gal. ($416,869) and pitch totalled 87,614 tons ($2,511,114). Phenol, cresols, xylenols, phthalic anhydride, tarred felts, coal tar paints, pitch coke, tar and asphalt cements, disinfectants, and asphalt saturants were other principal products. Eleven plants were operated in 1948, one in Nova Scotia, two in Quebec, five in Ontario, two in Manitoba and one in British Columbia.

Belgian Chemical Export Rates

Chemical exports from Belgium, which before the war amounted to 6 per cent of total exports and were valued at about Fr. 2 milliard annually, reached 10.5 per cent of total exports in 1947 and 8.7 per cent in 1948. Current plans for the manufacture of oil by-products are likely eventually to improve the chemical export rates.

Indian Vegetable Oils

The export of Indian oil seeds and vegetable oils in the first half of 1949 showed a decrease compared with the corresponding period of last year. Groundnut kernals were reduced from 50,000 to 38,000 tons; groundnut oil from 30,000 tons to 16,000 tons; linseed from 23,000 tons to 22,000 tons; linseed oil from 5000 tons to 3000 tons; castor oil from 13,000 tons to 1000 tons.

Australian Technicians go Overseas

Broken Hill Pty., Ltd., Australia's great iron and steel organisation, is sending four of its executives overseas to study the latest developments in metallurgy and engineering. A lead expert will go to Monterey, Mexico, where a lead refinery has asked for technical assistance with continuous refining processes which Broken Hill Pty., Ltd., carries out at Port Pirie, South Australia. Other staff members will visit the U.S.A.

Increasing Sweden's Aluminium Output

An agreement has been entered into between A. B. Svenska Metallverken, Vasteras and Aluminium, Ltd., Montreal, by which the Swedish firm will take over the Canadian company's interest in Svenska Aluminium-Kompaniet, A.B., nominally worth 1.75 million Swedish crowns. An expansion scheme enlarging the Svenska Metallverken company's rolling mill, is expected to result in doubling Sweden's present aluminium production.

Australian Oil Development

The modern installations at the Vacuum Oil Company's new refinery at Altona, Victoria, Australia, include 20 miles of pipelines to carry steam, air and crude oil. The refinery will use 1200 gal. of salt-water per minute for cooling. The storage tanks have a capacity of 6 million gal. of crude oil, and provision has been made for possible enlargement of the refinery if oil is struck in New Guinea, where the Vacuum Company is engaged in exploration work.

Next Week's Events

MONDAY, OCTOBER 24

Society of Chemical Industry

London: Horseshoe Hotel, Tottenham Court Road, W., 6 p.m. (Food Group, joint meeting with the London section of the Institute of Brewing). Prof. H. Lundin (Stockholm): "The Microbial Synthesis of Fats."

Leeds: University, 7 p.m. (Yorkshire section). D. Tabor: "Some Recent Experiments on the Friction of Solids."

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. J. H. Carrington: "A Talk on Rubber Compounding."

TUESDAY, OCTOBER 25

Society of Chemical Industry

Leeds: University, 6.30 p.m. (Joint meeting with the RIC and Leeds University Chemical Society). H. Baines: "The Chemist in the Photographic Industry;" and scientific films.

SCI Chemical Engineering Group

London: Geological Society, Burlington House, Piccadilly, W.1., 5.30 p.m. H. W. Thorp: "Chemical Engineering Problems in the Sea-Water Magnesia Process."

British Road Tar Association

London: May Fair Hotel, Berkeley Street, W.1, 2.30 p.m. Annual general meeting, followed by annual dinner.

Institute of Welding

London: 11 Upper Belgrave Street, S.W.1, 6.30 p.m. O. V. S. Bulleid Presidential address at opening of Autumn meeting (3 days).

WEDNESDAY, OCTOBER 26

Society of Chemical Industry

London: The Chemical Society, Burlington House, Piccadilly, W.1, 6.15 p.m. (Joint meeting of the Nutrition Panel and Agricultural Group). Dr. J. Hammond: "Genetic Factors Affecting the Nutritional Value of Animal Products;" R. H. Richens: "Genetic Factors Affecting the Nutritional Value of Crops."

Society of Instrument Technology

London: Manson House, 26 Portland Place, W.1, 6.30 p.m. F. Twyman: "Reflections on Fifty Years in the Optical Instrument Industry."

Manchester Literary and Philosophical Society (Chemical Section)

Manchester: Portico Library, Mosley Street, 5.45 p.m. J. F. Straatman: "Some British Raw Material for Chemical Industry."

Manchester Metallurgical Society

Manchester: Engineers' Club: Albert Square, 6.30 p.m. D. Binnie (president): "Problems Raised from the Study of Steel Ingots."

THURSDAY, OCTOBER 27

The Chemical Society

Liverpool: University, 4.30 p.m. Dr. R. S. Cahn: "Editing for the Chemical Society."

St. Andrews: University, 5 p.m. Dr. J. S. Anderson: "The Chemistry of Metallic Oxides."

South Wales: Cardiff University College, 7 p.m. Prof. C. K. Ingold: "Aromatic Nitration."

Chemical Engineering Society of University of Leeds

Leeds: University, 5 p.m. Members of the Institution of Chemical Engineers invited. Dr. Wild (AERE, Harwell): "Some Scientific Problems Connected with Nuclear Energy."

The Royal Institute of Chemistry

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Chairman's address. Dr. G. N. Burkhardt: "Some Amine-Aldehyde Condensates."

FRIDAY, OCTOBER 28

The Chemical Society

Glasgow: University, 3.30 p.m. Dr. M. P. Applebey: "The Art of Making Sulphate of Ammonia."

South Wales: Swansea, University College, 5.30 p.m. (Joint meeting with the RIC and University College of Swansea Students' Chemical Society). Prof. C. K. Ingold: "Aromatic Nitration."

SCI Chemical Engineering Group

Felstead, Essex: Works visit to beet sugar factory.

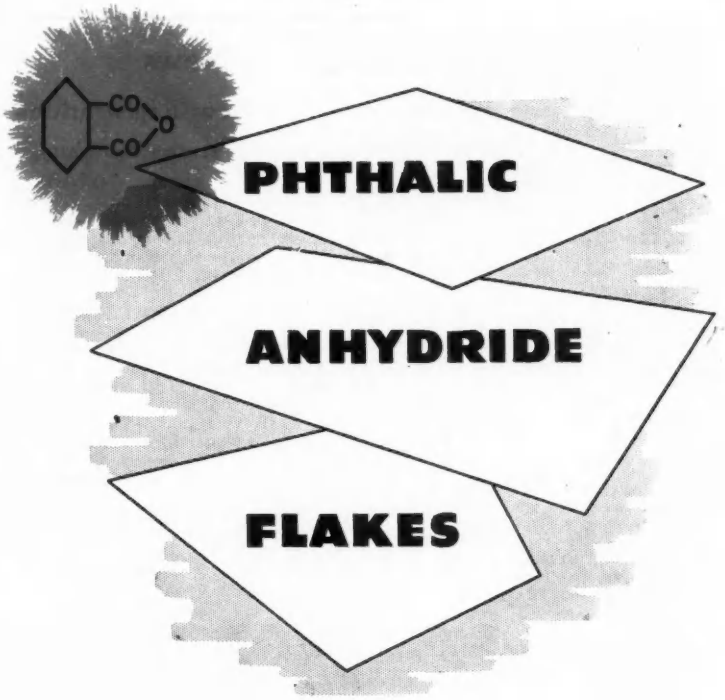
Electrodepositors' Technical Society

Sheffield: Grand Hotel. 6.30 p.m. (Sheffield and North-East Centre). A. W. Wallbank (new president): "The Relation Between the Laboratory and the Plating Shop."

SATURDAY, OCTOBER 29

Society of Leather Trades' Chemists

Manchester: Engineers' Club. Albert Square, 2 p.m. W. Cullen: "The Engineer, Engineering and the Tannery." Dr. F. P. Stowell: "Lime."



Phthalic Anhydride is one of two hundred chemicals made by Monsanto and used throughout the field of industry. Now available for immediate delivery

Please write to the Sales Department, indicating the industries in which you are interested, and asking for descriptive leaflets, with notes on current availability

MONSANTO CHEMICALS LIMITED
VICTORIA STATION HOUSE, LONDON, S.W.1

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summar ,but such total may have been reduced.)

BRITISH PLASTOIDS CO., LTD., Nottingham. (M., 22/10/49.) Plastic manufacturers, etc. Sept. 19, £500 debenture and £500 further charge, to C. R. B. Eddowes, Derby; respectively a general charge and charged on "Southfields," Barrow-on-Soar. *£3150. August 14, 1947.

MANCHESTER OIL REFINERY, LTD. (formerly REFINERY (HOLDINGS) LTD.), London, W. (M., 22/10/49.) September 16, deed supplemental to a Trust Deed dated April 4, 1949; charged on certain lands and buildings, etc., at Barton-upon-Irewell. *£650,000. June 28, 1949.

Satisfactions

CABLES AND PLASTICS, LTD., Leeds. (M.S., 22/10/49.) Satisfaction September 26, of debenture registered December 30, 1947, and further charge registered November 19, 1948 (both fully).

PAL CHEMICALS LTD., London, N.W. (M.S., 22/10/49.) Satisfaction September 29, of a mortgage registered January 6, 1949 (receiver 79-81 Scrubs Lane, N.W.).

Increases of Capital

The following increases in capital have been announced: THE ALMEX RECOVERY AND REFINING CO., LTD., authorised share capital, from £30,000 to £50,000; issued share capital, from £20,000 to £40,000.

Change of Address

INDUSTRIAL & MARINE PROTECTIVE APPLICATIONS, LTD., has removed from Bolton to Fountain Street, Barnbrook, Bury, Lancs.

New Registrations

A. B. Fleming & Company, Ltd.

Private company. (27,282). Capital £300,000. Manufacturers of dry colours, dyestuffs and chemicals, etc. Directors: A. A. Gray, E. W. Muirsmith, R. W. Gillan and H. Newton, Reg. office: Caroline Park, Edinburgh.

J. C. Hewitt Products, Ltd.

Private company. (473,290). Capital £100. Objects: To carry on the business of manufacturers of disinfectants, insecticides, vermin destroyers, etc. Directors: J. C. Hewitt and G. W. A. Steel. Reg. office: 4 Westbury Avenue, N.22.

Magnus Chemical Company, Ltd.

Private company. (473,290). Capital £2000. Manufacturers, refiners of chemicals, metals, metal alloys, salts and minerals, etc. Director: G. W. Wood. Reg. office: 39 New Broad Street, E.C.2.

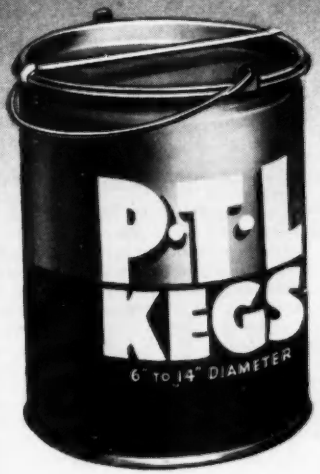
Visual Efficiency, Ltd.

Private company. (473,641). Capital £1000. Manufacturers of soap preparations, chemicals, gases, drugs, etc. Reg. office: 9 Arundel Street, W.C.2.

Scot's Advice to DSIR

AT a building research conference, arranged by the Department of Scientific and Industrial Research, held at Glasgow last week, speakers complained that research was not always conducted on practical lines. Mr. I. A. Moodie, county architect, Perth, said that while the department had given him details of the life-cycle of the wood-boring beetle it had left it to private enterprise to produce the insecticide which would destroy the pest. "They kindly gave me the name of the fumigation concern who could tackle this large-scale job. Unfortunately, it was an English firm, and when they discovered the type of wall construction used in Scotland they were completely at a loss. I suggest the research station should take the subject further and themselves follow up this matter of dealing with the pest."

AMONG THE SELECT



F. ROBINSON & CO., LTD.
SOUTHCOATES LANE,
HULL. Phone 31818

The Stock and Chemical Markets

INDUSTRIAL shares and British Funds were subject to selling and moved lower in price pending the Government statement on the crisis measures necessitated by devaluation of sterling and the danger of inflation. Although an increase in the Bank rate is not expected in the City at present, the view appears to be growing that it seems inevitable next year.

The general effect of latest developments means that it will apparently be difficult for many companies confined to the home market to maintain profits and dividends. Consequently, so far as industrial shares are concerned, buying has again centred on shares of companies prominent in the export drive.

It is realised, of course, that dividend limitation prevents shareholders from having a larger payment and that limitation will remain in force so long as there is no change of Government.

As was to be expected, shares of chemical and kindred companies moved closely with the prevailing trend in industrial securities and were generally lower on balance, although in most cases the decrease was not more than a few pence. Imperial Chemical were back to 43s. 1½d., but Monsanto Chemical at 51s. 3d. have been steady. Elsewhere, Turner & Newall receded to 76s. 9d., and United Molasses to 40s. 9d., while the units of the Distillers Co. were 27s.

In other directions, Albright & Wilson were 30s., Boake Roberts 28s. 9d., and Brotherton 10s. shares steady at 20s. Amber Chemical 2s. shares were 5s. 3d., F. W. Berk 13s., and Bowman Chemical 6s. 9d. Pest Control 5s. shares were quoted at 8s. 4½d.

Among preference shares, L. B. Holliday 4½ per cents were 20s. 3d., W. J. Bush 5 per cents 23s., and British Chemicals and Biologicals 4 per cents 18s. 9d. Elsewhere, British Aluminium ordinary have eased to 42s. 3d., but Borax Consolidated showed firmness at 58s. 9d. British Glues and Chemicals 4s. shares remained steady at 19s., although Lever and Unilever eased to 42s. 9d.

Glaxo Laboratories were influenced by the share bonus, and at £29 were again higher on balance. British Drug Houses 5s. shares were well maintained at 7s., but in other directions, Triplex Glass at 30s. moved lower despite the good impression created by the full results. Business around 23s. was again recorded in General Refractories.

Shares of companies associated with plastics were dull generally with British Xylonite back to 72s. 6d., De La Rue 22s. 6d., Kleemann 9s. 9d., and British Industrial Plastics 2s. shares 4s. 9d. Despite the bonus, Metal Traders shares came back to 52s. 6d., but Amalgamated Metal have been steady at 18s. 6d. Dunlop Rubber at 61s. 6d. were lower with other leading industrial shares.

Iron and steels continued to show small irregular movements as the threat of nationalisation has been deferred by the announcement that the General Election would not be held this year. United Steel at 26s. 3d. eased on the past year's lower profits, although the unchanged 8 per cent dividend remains covered by a substantial margin. Dorman Long were 29s. 6d., Guest Keen eased to 39s. 6d., Stewarts and Lloyds to 53s. 6d. and Firth Brown to 68s. 9d.

Boots Drug came back to 49s. 9d., Beechams deferred to 13s. 3d., and Griffiths Hughes to 19s. 1½d. Ilford 5s. shares changed hands around 22s. 9d. British Celanese eased to 16s. 6d. despite the higher profits and good impression created by the financial results.

Oil shares lost some ground, Anglo-Iranian being £7⅛, Shell 66s. 10½d. and Trinidad Leaseholds 25s.

Market Reports

THERE has been little change in the position on the industrial chemicals market and the movement remains steady with delivery specifications covering good quantities. New home business has been on a good scale although buyers in some instances are disposed to limit transactions to spot or nearby needs. The volume of overseas inquiry is well up to recent levels. The majority of the soda products are in active request and the potash chemicals continue firm. A good call is also reported for barium compounds, formaldehyde and bleaching powder. Price fluctuations due to changes in non-ferrous metal values have been experienced in the last few weeks and new rates have again been announced for red lead and white lead. The basis prices for the former now being £128 10s. per ton and for the latter £136 10s. per ton. Unchanged conditions characterise the position on the coal tar products market and home market quotations remain unaltered.

MANCHESTER.—A satisfactory feature of

the Manchester market for both light and heavy chemical products during the past week has been the continued demand from the home-using industries. Existing contracts are being steadily drawn against a fair weight of new business in the alkalis and a wide range of other products has been placed. On export account the demand seems to have been fairly well maintained, and new inquiries from the Empire and other leading outlets have been fairly numerous. In the market for fertiliser materials, basic slag, superphosphates and the compounds seem to be the most active sections.

GLASGOW.—Prices in the Scottish chemical market continue to be unsteady and a number of increases having been noted. There have also been a few decreases, particularly in lead compounds. There has been a very heavy demand for formaldehyde, which suppliers have so far been able to meet. The demand for paraformaldehyde has also shown an increase. Sales of whiting continue to increase in Scotland due mainly to the opening of factories depending on these supplies. In the export market there has been considerable activity in negotiations with dollar markets but some weeks may elapse before a definite indication can be given of the improved competitiveness of our chemical products at new rates.

KEEBUSH

Keebush is an acid-resisting constructional material used for the construction of tanks, pumps, pipes, valves, fans, etc. It is completely inert to most commercial acids; is unaffected by temperatures up to 130°C; possesses a relatively high mechanical strength, and is unaffected by thermal shock. It is being used in most industries where acids are also being used. Write for particulars to—

KESTNER'S

5 Grosvenor Gardens, London, S.W.1

BROWN & CO.

PACKING CASE MANUFACTURERS, JOINERS AND WOOD TURNERS.

Estimates given, including Packing, Freight Insurance, and all Charges port to port.

73 to 85 McALPINE STREET, GLASGOW, C.2.

Phone: 6566 Central (3 lines) ESTABLISHED 1870 Grams: "Boxes, Glasgow"

Is it used to make Paint?

It may be a resin, solvent, pigment, plasticizer, or some other chemical product, or it may be mills, mixers, processing plant, instruments, or containers that you are offering.

If it helps to make, test, or sell paint, your product is needed by our readers.

You can sell to the Paint Trade by advertising in "Paint Technology," the monthly technical journal read by the men who make paints, varnishes, enamels, cellulose lacquers, printing inks and linoleum, in Great Britain and 35 overseas countries.

LARGE PAGE (12 × 9 in.)

Printed on Art paper

ADVERTISEMENT RATES (for 12 insertions): Page, £16; Half, £9–10s.; Quarter, £5–15s.; Eighth, £3–10s.

Specimen copy on request

PAINT TECHNOLOGY

Incorporating SYNTHETIC AND APPLIED FINISHES (Estd. 1930)

5 GRANGE COURT, PINNER, MIDDX. 'Phone: HARrow 6996

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

Great Possibilities for

QUALIFIED CHEMICAL ENGINEERS

VAST and far-reaching developments in the range of peacetime productions and markets of the Chemical Industry mean that the profession of Chemical Engineering will be of great importance in the future and one which will offer the ambitious man a career of outstanding interest and high status. The T.I.G.B. offers a first-class training to candidates for the Chemical Engineering profession.

Enrol with the T.I.G.B. for the A.M.I.Chem.E. Examinations in which home-study students of the T.I.G.B. have gained a record total of passes including—

FIVE "MACNAB" PASSES

and

FIVE FIRST PLACES

Write to-day for the "Engineers' Guide to Success"—free—containing the world's widest choice of Engineering courses—over 200—the Department of Chemical Technology, including Chemical Engineering Processes, Plant Construction Works Design and Operation, and Organisation and Management—and which alone gives the Regulations for A.M.I.Chem.E., A.M.I.Mech.E. A.M.I.E.E., C. & G., B.Sc., etc.

THE TECHNOLOGICAL INSTITUTE

OF GREAT BRITAIN

219 Temple Bar House, London, E.C.4

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order

APPLICATIONS are invited from **QUALIFIED ENGINEERS,** B.Sc. or A.M.I.Mech.E., for important Chemical Works, Manchester Area.

Applicants should not be over 40 years of age, and have experience in Maintenance, Chemical Plant Erection and Design. Position offered is permanent and progressive. Only men of proved ability need apply. Address, in first instance, with particulars of qualifications and experience in detail, and salary expected.

Box No. 2857, The Chemical Age, 154, Fleet Street, London, E.C.4.

CORROSION ENGINEERS, preferably not over 35' required for large Oil Company for Middle East duties for work connected with cathodic protection of thousands of miles of trans-desert pipe-lines and will include design, installation and operation of such protective schemes, together with study of pipe coating procedure and materials. Post offers extensive opportunities in new field to man of initiative.

Candidates for acceptability should have Honours Degree in Electrical Engineering or Physics or Physical Chemistry, with strong background of electricity and engineering and be able to combine first-rate theoretical background with bias to field work. Practical attitude and good knowledge of electro-chemistry essential. Experience should include minimum of five years' work in industry.

The appointment would carry substantial allowances and would be at a salary commensurate with general acceptability; the service is pensionable. Write, quoting **No. 396, to Box 3086 c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

SITUATIONS VACANT

CHEMICAL MANUFACTURING COMPANY in the North-West have a vacancy in their Development Department for an experienced **CHEMICAL ENGINEER.** Applications are invited from persons who possess A.M.I.Chem.E. qualifications or equivalent. For the successful applicant the position is permanent and pensionable. Write, giving full particulars, to **Box No. 2852, The Chemical Age, 154, Fleet Street, London, E.C.4.**

ESTABLISHED Export and Merchant business requires experienced **PURCHASING MANAGER** for new department handling chemicals produced in U.K. and elsewhere. Salary £750–£1,200 p.a. Write, stating age, education, qualifications, and experience, **c/o Company's Auditors, Messrs. Binder Hamlyn & Co., River Plate House, South Place, London, E.C.2,** marking envelope **"Chemical Buyer."**

PRODUCTION MANAGER, age 35, experienced in sulphuric acid manufacture, required at a large chemical works in West Riding—producing range of additional products. Good prospects for suitable applicant. Pension scheme. Full particulars and salary to: **Works Manager, Box No. 2851, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.**

THE MIDLAND TAR DISTILLERS LTD., Oldbury, Nr. Birmingham, require **CHEMICAL ENGINEERS** possessing a Degree in Chemical Engineering or A.M.I.Chem.E. Applicants must have had several years' industrial experience in Chemical Engineering and development work. A first-hand knowledge of the Oil Refining Industry an advantage. Full particulars to **Personnel Manager.**

SITUATIONS WANTED

B.Sc., F.R.I.C., many years responsible position with important light engineering company. Laboratory and factory control, raw materials, processes, plant, sales service and technical liaison experience. Seeks change, industrial consultant, technical, technical-commercial. Reply Box No. 2850, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

ORGANIC RESEARCH CHEMIST (age 30), with several years' experience in Dyestuffs, Dyestuff Intermediates, Oils, Fats and Waxes, seeks post in any of the above fields. Apply Box No. 2854, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

TECHNICAL DIRECTOR AND CHIEF CHEMIST, A.R.I.C. (age 33) requires responsible position. Extensive experience in Fine Chemicals, Dyestuffs, Oils, Fats and Waxes and Detergents. Used to planning research programmes and controlling large technical staffs. Apply Box No. 2853, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

FOR SALE

ACCURATE Powders for all industries. DOHM LTD. 167, Victoria Street, London, S.W.1.

FOR SALE

GEORGE COHEN'S 600

TWO DIRECT ELECTRICALLY UNDER-DRIVEN HYDRO EXTRACTORS by **Thos. Broadbent,** three-point suspension, pit type, with 72 in. diam. galvanised perforated basket. Hand-operated brake, non-interlocking wire mesh cover. Starter and motor suitable for 400/3/50 cycles.

ALUMINIUM HORIZONTAL CYLINDRICAL STORAGE TANK, 7 ft. 6 in. diam. by 36 ft. long overall. Fabricated from ⅜ in. aluminium sheet of 99.5 per cent purity. Welded construction, all welds dressed, giving smooth interior finish.

STEAM-DRIVEN HYDRO EXTRACTOR by **Thos. Broadbent,** three-point suspension type with 72 in. diam. galvanised perforated basket.

TWO HUMMER ELECTRIC VIBRATING SCREENS by **Mining & Industrial Equipment Ltd.,** type V.4000. Single-deck type, 8 ft. long by 4 ft. wide ; mesh at present fitted, ¼ in. by ¼ in.

ELEVATOR, part steel enclosed, of the continuous chain and bucket type, buckets approx. 10 in. by 7 in elevator centres 63 ft., together with a 5 h.p. 40/1 worm reduction gearbox, but excluding motor.

TWO IDENTICAL STEEL-ENCLOSED BUCKET ELEVATORS, each 29 ft. centres. Casing, 2 ft. 9 in. by 1 ft. 6 in. ; buckets, 10 in. by 6¼ in. by 4 in., set at approx. 2 ft. 6 in. centres. Buckets on single Renold chain.

SIZE 7 DUPLEX MIXING AND KNEADING MACHINE by **Morton of Wishaw.** Steam-jacketed trough approx. 42 in. by 38 in. by 30 in. Working capacity, 115 gals. Double Naben type twin gun-metal mixing blades. Internal w.p., 15 lb. per sq. in., or high vacuum. Power-operated tilting.

FIVE PEERLESS WHISKS OR MIXERS, 80 qt. capacity. Single high-speed type. Direct driven from 5 h.p. motor 400/3/50. New tinned pans, 20 in. diam. Various whisks, beaters, etc.

BAKER PERKINS DOUBLE TROUGH TILTING MIXER. Alloy trough, 20 in. by 14 in. by 17 in. deep. Aluminium interlocking hinged cover, gun-metal gate-type agitators driven through gearing. Pulley drive.

HORIZONTAL MIXER by **Krupp.** Approx. internal dimensions, 5 ft. by 5 ft. by 5 ft. Non-tilting double trough with heavy twin "Z" blades, bottom discharge along apex formed by troughs at present driven by 50 h.p. D.C. motor.

GEORGE COHEN SONS & CO. LTD.,
SUNBEAM ROAD, LONDON, N.W.10.
Tel. : Elgar 7222 and
STANNINGLEY, Nr. LEEDS.
Tel.– Pudsey 2241.

BROADBENT 48-in. SUSPENDED TYPE HYDRO EXTRACTOR, overdriven from 15 h.p. motor 400/3/50 supply, together with Pony motor for slow running.

BROADBENT 48-in. HYDRO EXTRACTOR ; three-point suspension, galvanised basket and complete with 15 h.p. motor, starting equipment and reverse current braking switch suitable for 400/440 volt 3-phase 50-cycle supply.

18-in. diam. WILKINSON OINTMENT MILL, with marble refining discs and enamelled hopper and agitator, and complete with driving motor.

TUNGSTONE ACID PUMPS. A number available in Ebonite, Bronze and Tufnol.

SILICA COILS of 2½ in. bore, comprising 60 ft. formed into seven turns at 2 ft. 6 in. diam., complete with teak supporting framework. (Brand new.)

NEWMAN INDUSTRIES, LIMITED.
YATE. BRISTOL.

FOR SALE

BOILERS.

SUPER-ECONOMIC

One—8 ft. by 12 ft. 6 in. ,150 lb. p.s.i. working pressure. Rated capacity, 6,100 lb. steam/hour. Danks, 1937. Fitted with Riley underfeed stoker.

One—7 ft. 6 in. by 11 ft., 220 lb. p.s.i. working pressure. Rated capacity, 4,500 lb. steam/hour. Danks, 1938. Fitted with Riley underfeed stoker and 80 ft. self-supporting steel stack.

LANCASHIRE

Two—7 ft. 3 in. by 28 ft., 80 lb. p.s.i. working pressure. 4,500 lb. evaporation. Fitted with Wilton steam jet hand-fired furnaces.

One—7 ft. 6 in. by 25 ft., 65 lb. p.s.i. working pressure. Fitted with Wilton steam jet furnaces.

WM. BUTLER & CO. (BRISTOL) LTD.,
Crew's Hole Works,
St. George, Bristol, 5.

CHARCOAL, ANIMAL and VEGETABLE, horti-cultural, burning, filtering, disinfecting, medicinal, insulating ; also lumps ground and granulated ; established 1830 ; contractors to H.M. Government.—THOS. HILL-JONES, LTD., " Invicta " Mills, Bow Common Lane, London, E. Telegrams, " Hilljones, Bochurch. London." Telephone : 3285 East.

GOVERNMENT unused 36-in. diam. Ve Wallntilating Fans, ball bearing, V pulley drive, £3 each nett ex-works. THOMPSON & SON (MILLWALL) LTD., Cuba Street, London, E.14.

GARDNER Type Sifter and Mixer, 1 cwt. capacity.
Small Ball Mill, 17 in. diam. by 10 in. deep.
C.I. Steam-jacketed Mixer, 28 in. diam. by 32 in. deep.
Bench Model Double Can Seamer.
Jackson & Crockatt Minor Powder Filling Machine.
Small Homogeniser.
Lister Oak Churn for Powder Mixing.
Albro Single-head Vacuum Bottle Filling Machine.
Several Labelling Machines.
Write Box No. 2855, The Chemical Age, 154, Fleet Street, London, E.C.4.

SPECIAL TANKS FOR SALE

HORIZONTAL CYLINDRICAL TANK, 70 ft. long by 7 ft. diam., approximately, fitted with steam coils and lagged heavy construction.

SECTIONAL CYLINDRICAL TANK, 76 ft. long by 7 ft. diam., in 3 main sections with removable end doors. Has been working under pressure and vacuum.

HORIZONTAL CYLINDRICAL TANK, 18 ft. 6 in. long by 6 ft. 6 in. diam.

WILLIAM R. SELWOOD, CHANDLER'S FORD, HAMSPHIRE

LIGHTWEIGHT MOTOR TRUCKS and **TRACTOR UNITS** for factories, etc., ex stock, brand new. 10 cwt capacity. From £85 complete.
WILLIAM R. SELWOOD, CHANDLER'S FORD, Hants.

NEW STAINLESS STEEL PLANT
For all needs
REACTION VESSELS, STILLS, TANKS, BUCKETS, BOILING PANS, ROAD TANKS, ETC.
SPECIAL ATTENTION TO EXPORT

We specialise in finding unusual secondhand items for our customers. If you do not receive our monthly list, please let us have your address. May we help you ? We are not dealers but only supply plant on commission.

R. F. PAGET,
Chemical and General Engineer,
MANOR HOUSE, BARWICK-IN-ELMET, LEEDS
Tel : Barwick-in-Elmet 216.

FOR SALE

SEVERAL small steam-jacketed Copper Pans.
Several Ball Mills, 6 ft. 6 in. by 6 ft. 8 in., Silex-lined batch type, with driving gear and clutch.
8 Simon type Portable Slat Conveyors, 20 ft. long, for boxes or bags.
Mixing Pan, 6 ft. dia. by 5 ft. deep, flat bottom, open top.
Ditto, 3 ft. dia. by 5 ft. deep, flat bottom, open top.
2—6 in. Centrifugal Pumps by Cherry.
Milton Grinders fitted with 30 in. vertical stones, belt driven with shaker feeds.
1 Iwel 20 in. Turbine Centrifugal Extractors with spare baskets.
4 vertical Hall Ammonia Compressors, single cylinder, belt driven cylinders 3 in. to 5 in. bore.
2 Alfa-Laval Disc Separators, belt driven, size 45 and 65, with chambers 12 in. and 15 in. dia.
2 unused belt driven Ram Pumps, fitted one ram 1¼ in. dia., 3 in. stroke. brass fitted.
Alpine type Perplex Grinder, chamber 20 in. dia.
Ditto similar. chamber 18 in. dia.
Single pair toothed Crushing Roll, belt and gear driven, last used for soap crystals.
2 Steam Jacketed Mixing Pans.
21—8 gallon capacity Ball Mills.
4 Mather & Platt Colloid Mills.
424 ft. B.B. Gravity Conveyor, steel rollers, 14 in. long by 6 in. pitch.
Torrance Positive-geared Edge Runner Mill.
5 Riveted Vessels, partly jacketed and plain, with agitators and coils, as used in oil-refining trade.
2 Miracle Super Hammer Mills, size 3W, each with 65 H.P A.C. Motor, vee rope drive, cyclone, fan and all belongings.
Gardner Rapid Sifter Mixer, 4 ft. long.
Gardner 10 ft. steam jacketed Dryer.
3 pair high toothed Crushing Mill by Nicholson with coarse, medium and fine toothed rollers 22 in. long, belt and gear driven.
Baker Perkins Jacketed Mixer, 36 in. by 33i n. by 30 in., deep double fin type agitators, machine cut gearing and automatic screw tipping.
18 Steel-built Chain and Bucket Elevators. Buckets, 6 in. to 8 in. long. Elevators, 14 ft. to 30 ft. high.
14 various Worm Conveyors, complete in troughs, 8 in to 12 in. diameter, 9 ft. to 40 ft. long.

Write: RICHARD SIZER LIMITED, ENGINEERS CUBER WORKS, HULL

HORIZONTAL **TUBULAR DRIER** by Henry Simon, Ltd., having mild steel trough, 8 ft. by 3 ft. by 2 ft. 6 in. deep; bottom hinged, detachable for discharging; having nest of nine 4-in. revolving mild steel steam tubes, suitable for 100 lb. working pressure; carried on glanded shafts through end-plates and driven by chain from countershaft. Price, £150. Box No. 2846, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

METAL Powders and Oxides. Dohm Limited, 167, Victoria Street, London, S.W.1.

ROOTS BLOWER, inlet 8½ in. by 14 in., outlet 4 in., fast and loose pulleys 8 in. by 2½ in. Price £25. THOMPSON & SON (MILLWALL) LTD., Cuba Street, London, E.14.

Phone 98 Staines

WELDED Steel-jacketed Mixers, 25 in. by 25 in. and 3 ft. 6 in. diam. by 4 ft.
Weir & Serck Heat Exchangers, 120-160 and 350 sq. ft.
Jacketed Vacuum Tilting Gunmetal Mixer, 28 in. by 26 in. by 20 in. deep.
Jacketed Vertical Steel Autoclave, 7 ft. 6 in. by 5 ft. diam. (Mixing Gear.)

HARRY H. GARDAM & CO., LTD., STAINES.

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each, Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills, Preston, Lancs. Phone 2198

FOR SALE

MORTON, SON & WARD LIMITED

—OFFER—

SELECTED CHEMICAL PLANT

Six—New rectangular **OPEN TOP STAINLESS STEEL TANKS,** 200 gallons capacity in timber cradles.
Five—New **OPEN TOP CYLINDRICAL STAINLESS STEEL TANKS,** 500 gallons capacity, 5 ft. dia. by 4 ft. deep.
Three—4-pot **STAINLESS STEEL BALL GRINDING MILLS** with two containers 1 ft. 2 in diam., by 1 ft. 3 in. deep and two 9 in. diam. by 10 in. deep, driven through vee ropes from new 2 h.p. Laurence Scott motors, 400/3/50 cycles supply with push-button starters.
Two—Unused 40 gallon **STEAM JACKETED MIXING PANS,** 2 ft. diam. by 2 ft. deep with overdriven stirring gear. 50 lb. per sq. inch working pressure in jackets.
One—21,000 g.p.h. against 52 ft. head **VACSEAL VULCANITE LINED CENTRIFUGAL ACID PUMP,** direct coupled to 15 h.p. E.E.C. motor, complete with oil immersed stand mounted Ellison starter with ammeter, all for 400/3/50 cycles supply.
Three—200 gallon **UNJACKETED OPEN TOP MILD STEEL WELDED MIXING PANS,** 3 ft. diam. by 4 ft. 6 in. deep with overdriven stirring gear, fast and loose pulleys. (New and unused).

MORTON, SON & WARD LIMITED,
WALK MILL, DOBCROSS, Nr. OLDHAM, LANCS.
Phone: Saddleworth 437

UNUSED—1 **Manesty Rotary Tablet Machine.** Extra set Punches and Dies.
1 **Manesty Granulating Mixer.**
Write Box Office No. 2856, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

TWO—ROTARY AIR COMPRESSORS by Hick Hargreaves, each 615 cu. ft./min. at 5 lb. p.s.i. 1450 r.p.m.
ONE—Ditto, 546 cu. ft./min. at 10 lb. p.s.i., 960 r.p.m.
TEN—Andco 6 in. worm-operated **PLUG COCKS.**
FOUR—Andco 2 in. worm-operated **PLUG COCKS.**
ONE—Andco 1½ in. worm-operated **PLUG COCK.**
TEN—Andco 1 in. worm-operated **PLUG COCKS.**
FOURTEEN—¾ in. worm-operated **PLUG COCKS**
ONE—Steel-cased **WORM CONVEYOR,** 8 ft. long.
ONE—Sectional Pressed Steel **STORAGE TANK,** 12 ft. by 12 ft. by 8 ft.
ONE—Insulated Mild Steel **COLUMN,** dish ends 3 ft. 11 in. diam. by 11 ft. 3 in. high.
ONE—Enclosed Cast-iron **BLENDING VESSEL,** 2 ft. 6 in. diam. by 4 ft. deep with agitator for 400 volts 3-phase, 50 cycles.
SIX—Enclosed Cast-iron **RECEIVERS,** 3 ft. diam. by 3 ft. 6 in. deep, fitted with brass basket coil and sight glasses.
ONE—All-brass **PRODUCT RECEIVER,** 2 ft. 11 in. diam. by 3 ft. 10 in. deep.
TWO—All-brass **PRODUCT RECEIVERS,** 2 ft. 11 in. diam. by 4 ft. 9 in. deep.
ONE—Lead-lined Welded M.S. **ETHYLENE COOLER,** 3 ft. diam. by 3 ft. 6 in. deep
ONE—All-brass **PRODUCT HEAD TANK,** 3 ft. 11 in. diam. by 4 ft. 9 in. deep.
ONE—M.S. **BLOW EGG.** 3 ft. diam. by 5 ft. deep.
FOUR—C.I. **CONDENSER SHELLS,** 2 ft. 9 in diam. by 9 ft. long.
TWO—C.I. **BLENDING VESSELS,** 2 ft. 6 in. diam. by 4 ft. long.
TEN—C.I. **CATCHPOTS,** 1 ft. 6 in. diam. by 1 ft. 9 in. deep (three fitted lead coils).
EIGHT—C.I. **MIXING VESSELS,** 2 ft. 6 in. diam. by 2 ft. 3 in. deep.
ONE—Copper **BLOW EGG,** 2 ft. diam. by 3 ft. 3 in.
EIGHT—Enclosed C.I. **ETHYLENE RECEIVERS,** 3 ft. diam. by 3 ft. 6 in. deep.

ABELSON & CO. (ENGINEERS) LTD.,
Coventry Road, Sheldon, Birmingham, 26.
Tel.: Sheldon 2424.

FOR SALE

6 POWDER FILLING AND WEIGHING MACHINES by Southall & Smith. Excellent condition.
2—**TABLETTING MACHINES,** hand or belt drive; single punch action.
1—**OINTMENT MILL,** 13 in. by 12½ in. deep pan, B/D.
2—**PORTEOUS DRUM MIXERS,** hand tilting, 2 ft. 1 in. diam. by 3 ft. 6 in. deep. B/D.
1—**STAINLESS STEEL TANK,** 6 ft. by 3 ft. 6 in. diam., totally enclosed, new. Other sizes by request. Quick delivery. Keen prices.

TOPPING & HENDERSON LTD.,
Market Hall Chambers, Eccles, Manchester.
Phone Eccles 3920 and 3040.

PATENTS & TRADE MARKS

KING'S PATENT AGENCY, LTD. (B. T. King, A.M.I.Mech.E., Patent Agent), 146a, Queen Victoria Street, London, E.C.4. ADVICE Handbook, and Consultation free. Phone: City 6161.

SERVICING

GRINDING, Drying, Screening and Grading of materials undertaken for the trade. Also Supplier of Ground Silica and Fillers, etc. JAMES KENT, LTD., Millers, Fenton, Staffordshire. Telegrams: Kenmill, Stoke-on-Trent. Telephone: 4253 and 4254, Stoke-on-Trent (2 lines).

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hilljones, Bochurch, London." Telephone: 3285 East.

HYDROGEN PEROXIDE
Concentrated Qualities Dyestuffs & Chemicals
COLE & WILSON, LTD.
24, Greenhead Road, HUDDERSFIELD
Phone: Huddersfield 1993. Grams: 'Colour' Huddersfield

TRIBASIC PHOSPHATE OF SODA
Free Running White Powder
Price and sample on application to:
PERRY & HOPE, LIMITED, Nitshill, Glasgow

"LION BRAND"
METALS AND ALLOYS
MINERALS AND ORES
RUTILE, ILMENITE, ZIRCON,
MONAZITE, MANGANESE, Etc
BLACKWELL'S
METALLURGICAL WORKS LTD.
GARSTON, LIVERPOOL, 19
ESTABLISHED 1869

Controlled by The Staveley Coal & Iron Co., Ltd

TANKS, PANS, TOWERS, PUMPS, ETC.

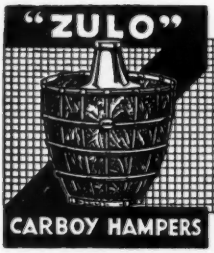
Built in Tantiron, Lead, Keebush and non-ferrous metals.

Lennox Foundry Co. Ltd.

Glenville Grove, London, S.E.8

Specialists in corrosion problems

"ZULO"



CARBOY HAMPERS

LEIGH & SONS METAL WORKS

Orlando St. BOLTON

BELTING

AND

ENDLESS VEE ROPES

Superlative Quality

Large Stocks - Prompt Despatch

FRANCIS W. HARRIS & Co. Ltd.

BURSLEM - Stoke-on-Trent

'Phone : Stoke-on-Trent 87181-2

'Grams : Belting, Burslem

Solvent Recovery Plant

Carbon Adsorption System

British Carbo-Norit Union, Ltd.

14, High Holborn, W.C.1.

S. GIRLING & SONS,

(COOPERS) LTD.

Barrel & Drum Merchants

STEEL DRUMS RECONDITIONED BY US

SPEEDY DELIVERIES

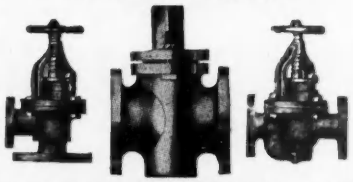
Suitable for all Trades

Office and Cooperage:

59 LEA BRIDGE ROAD, LEYTON, E.10

Tel: Leytonstone 3852

FOR VALVES AND COCKS FOR ACIDS IN IMPROVED DESIGNS



HAUGHTON'S METALLIC CO., LTD.

30, ST. MARY-AT-HILL, LONDON, E.C.3.

WOOD & FAIRWEATHER

Successors to

RICHARD HOYLE & Co.

FOR

BLACKS

which have stood the test of time

NEWCASTLE-UPON-TYNE

ESTABLISHED 1864

"Fullersite" SLATE FILLER

for

BITUMINOUS PRODUCTS, PAINTS, MOULDED RUBBER GOODS, PHARMACY, CERAMIC WARE

apply :—PENRHYN QUARRIES

B.G.F. Adlington, Agent

Port Penrhyn, Bangor

CARBOY HAMPERS

Safety Crates Packed Carboys

"VULCAN" BRAND

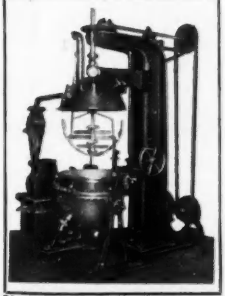
HARRIS (LOSTOCK GRALAM) LTD.

Lostock Gralam Northwich

Telephone:
2217 (2 lines) NORTHWICH
Telegrams:
"VULCAN" LOSTOCK GRALAM

COPPER PLANT

for the CHEMICAL TRADES

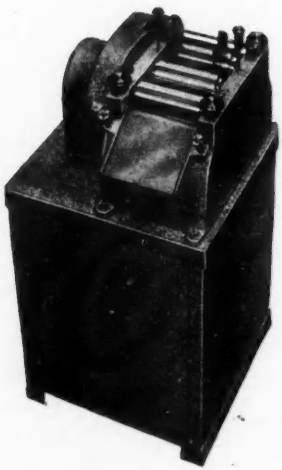


Steam Jacketed Copper Boiler and Mixer to tilt, with Vacuum Pump, and jet condenser, Cover and Agitator raised by bevel gear and hand-wheel.

STILLS
RECTIFYING COLUMNS
CONDENSERS

Autoclaves
Calandrias
Vacuum Pans
Boiling Pans
Pipework, Coils, etc.

BLUNDELLS &
T. ALBERT CROMPTON & Co. Ltd.
WEST INDIA DOCK RD., LONDON, E.14
Phone: East 3838 (3 lines) Grams: Blundell, Phone, London
ESTABLISHED 1825



for laboratory and small-scale production

Pascall Roller Mills are ideal. Research chemists find them to be of inestimable value for experimental work, sampling, production testing and small scale production.

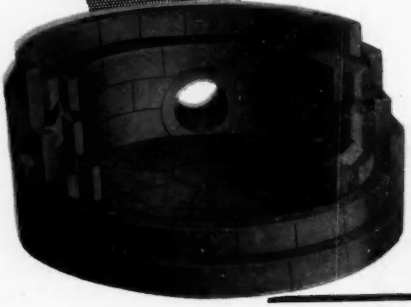
They will refine various materials such as creams, ointments, pastes, paints, printing inks, plastics, etc., and are available with either steel or porcelain rolls.

PASCALL
ROLLER MILLS

Write for List CA 1049

THE PASCALL ENGINEERING CO. LTD., 114 LISSON GROVE, LONDON, N.W.1.

A BULWARK AGAINST CORROSIVE ATTACK



The burden of maintenance in chemical plants may often be lightened by the judicious use of Accrington " Nori " Ware. It provides a bulwark against the action of corrosive liquids and gases, is extremely tough and durable, and highly resistant to impact and abrasion.

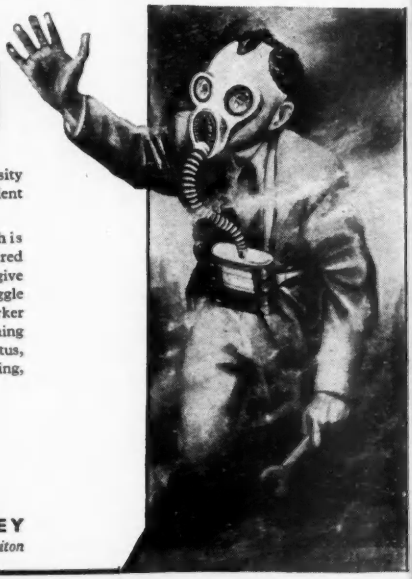
For packings and linings of towers, for dephlegmators, stills, saturators, for tanks and other vessels, Accrington "Nori" Ware is adopted as a standard material in the leading chemical factories at home and abroad.

Please ask for literature.

ACCRINGTON BRICK & TILE CO. LTD
ACCRINGTON
Telephone: Accrington 2684

Accrington 'NORI' ACID RESISTING WARE

PROTECTION



IN Chemical Works, Refrigerating Plants, etc., the necessity for dealing with gas escapes and repair work calls for efficient protection of the men on the job.

This is provided by the " PURETHA " Respirator, which is comfortable, efficient and simple. Its canisters are coloured according to the gas or group of gases against which they give protection. Full mask and mouthpiece, nose-clip and goggle types. All other protective devices for the industrial worker also manufactured and supplied : Self-contained breathing apparatus, smoke-helmets, short-distance fresh-air apparatus, resuscitating apparatus, dust masks, protective clothing, goggles, etc.

SIEBE, GORMAN & CO. LTD
LONDON
EVERYTHING FOR SAFETY EVERYWHERE

TOLWORTH, SURBITON, SURREY
Telephone : Elmbridge 5900 *Telegrams : Siebe, Surbiton*

Printed in Great Britain by THE PRESS AT COOMBELANDS, Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 22 October 1949. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.